IN THIS ISSUE: A New Record in High Tension Transmission

JOURNAL OF ELECTRICITY

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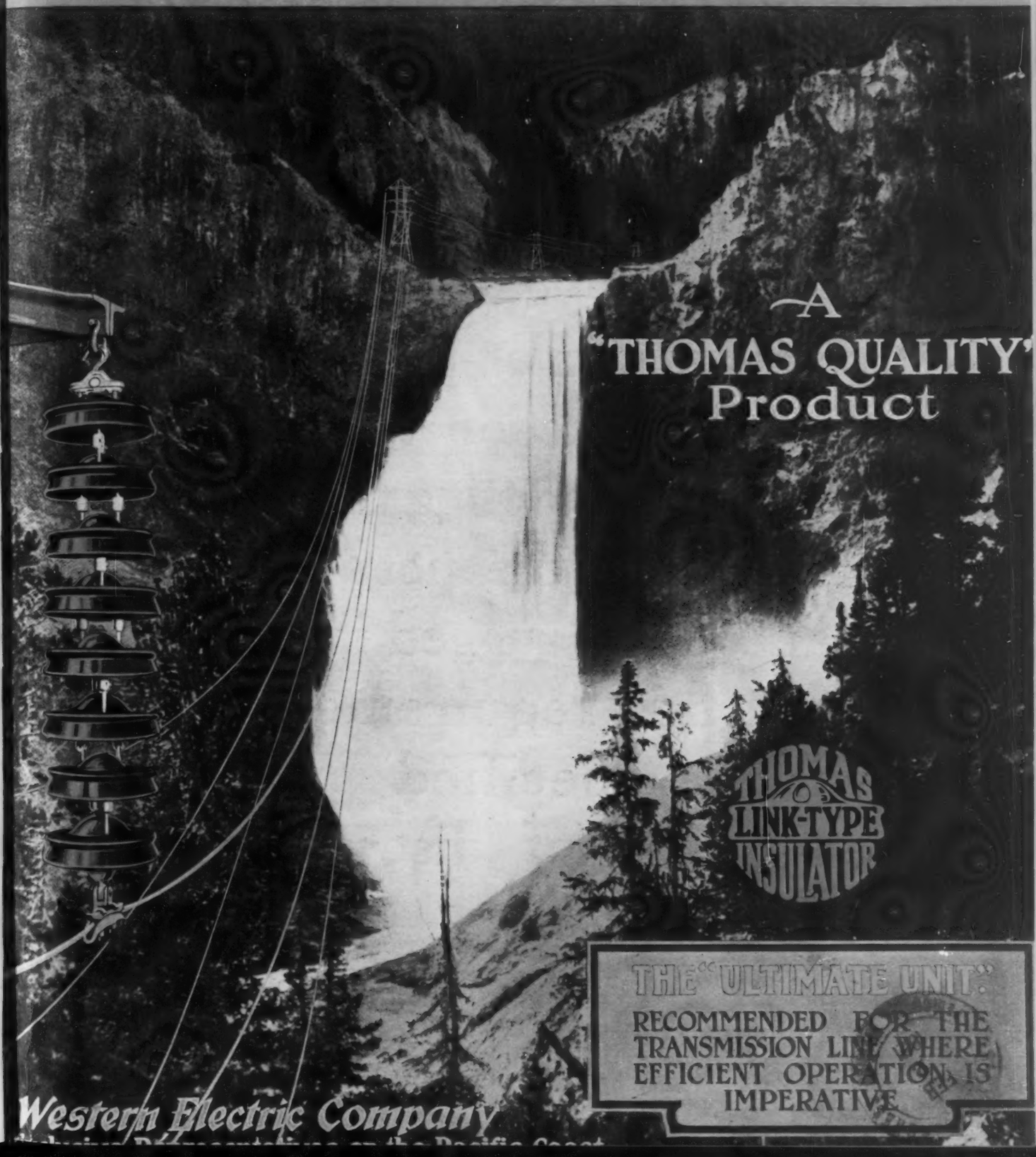

The year 1921 is auspicious for Western Power Development. More hydro-electric power will be harnessed and applied to industrial uses in the West in this and the few succeeding years than in any previous similar period. The best construction will be utilized in transmitting this power because it is the most economical. "J-D" rugged insulators meet this requirement and will be specified by most engineers of discernment.

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ROBERT SIBLEY, Editor H. W. L. GARDINER, Business Manager

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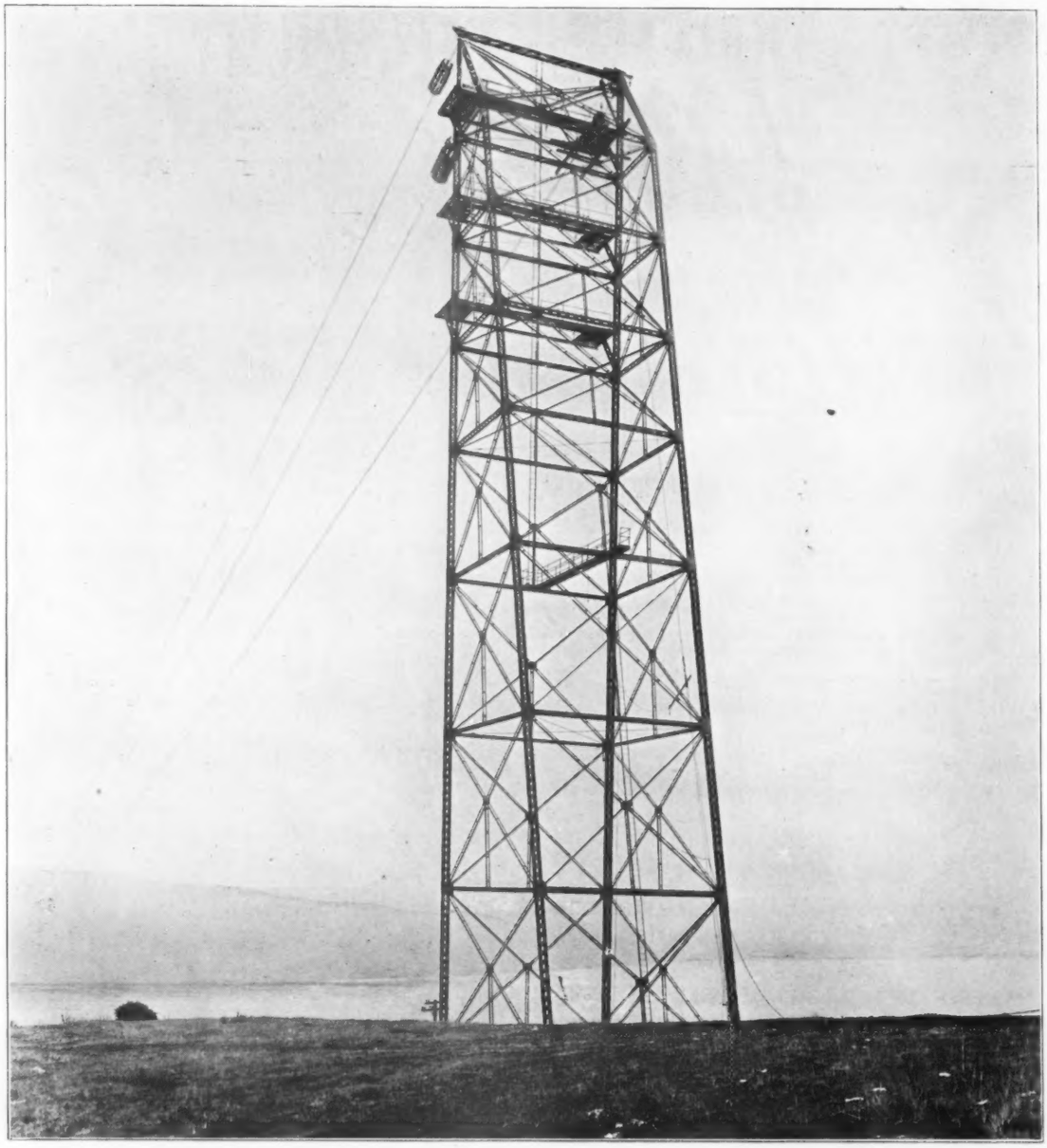

Building the World's Highest Voltage Transmission System

THE industrial stir throughout the West, making ever-increasing demands in hydro-electric development, is rapidly crystallizing in the establishment of many new and interesting world's records in engineering. Here is shown a view of the Great Western Power Company's new transmission system at the point where it crosses Carquinez Straits, near Benicia, California. Each of the three wires shown has a span of 4753 feet—ranking among the longest spans in the world. But the most remarkable feature of this new system is the fact that within a month these wires will connect San Francisco with the Caribou plant one hundred and ninety miles distant, conveying power at a voltage of 165,000, the highest thus far attained in engineering achievement.

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 46 SAN FRANCISCO, JANUARY 15, 1921 Number 2

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Westward, Ho!

EVERYWHERE in Eastern centers, and particularly in New York, the Western visitor is impressed with the interest manifested in the upbuilding of the Far West. The very mention of the word "Pacific" and its silver-lined shores always calls forth a pleased response, and behind the smile there is apparent a secret longing of the individual that some day fortune may bring him west of the Rockies. Never have the opportunities been greater than in the year 1921, and the Journal of Electricity extends its greetings not only to those who live in the West, but to the thousands, yes, millions, who secretly yearn to take part in the upbuilding of this great empire where engineering, commerce, and industry are in the making, and are distinguished by a certain enthusiasm and newness of life equaled nowhere else in the world.

The New Record in High Voltage Transmission

In its quest for additional hydroelectric energy, the West has developed its resources in a circle ever widening from its centers of population. Time and again this region has pioneered in length and voltage of transmission. The year 1920 will long be remembered as the year in which California started actual construction of the first 220,000-volt transmission system and purchased apparatus for what will become another 220,000-volt system.

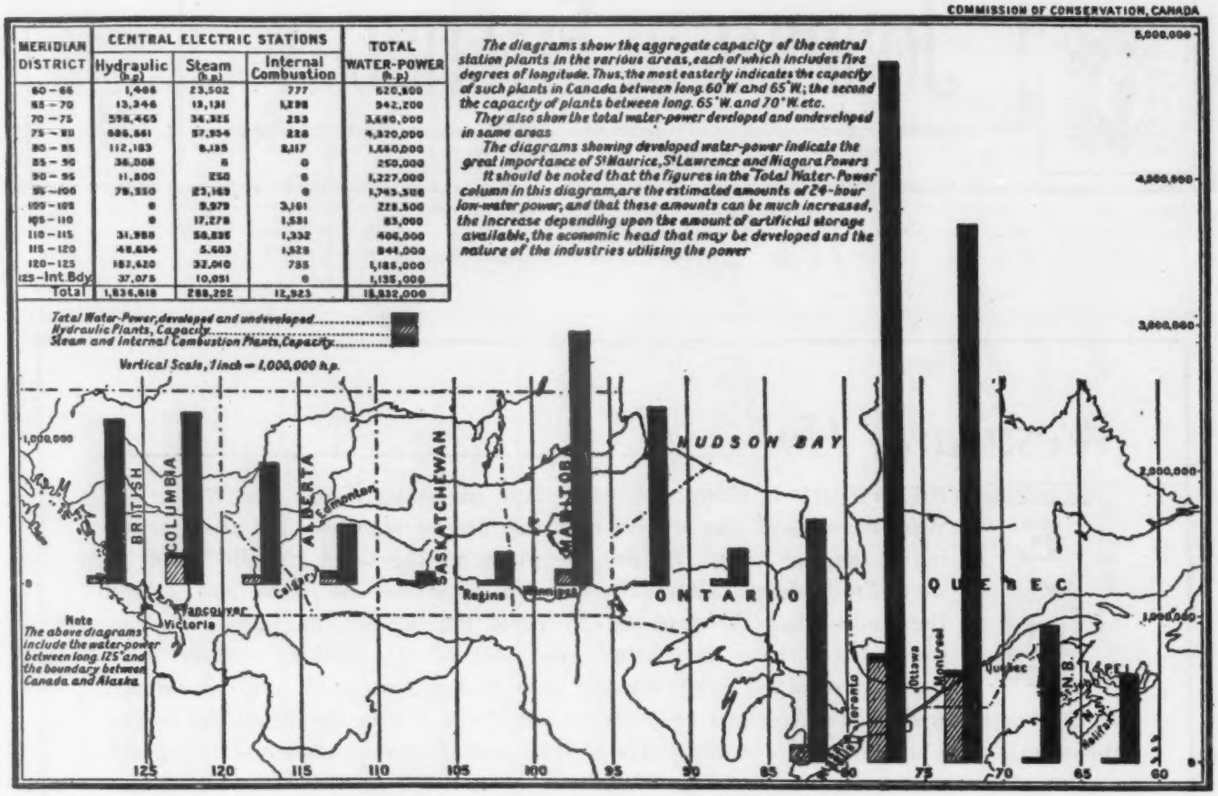
It is interesting to review the progress of the past few years in design, in manufacture and in operation that guarantees the success of 220,000-volt transmission. The knowledge of high voltage phenomena has been greatly advanced by the researches of Harris J. Ryan, F. W. Peek and others. It is known that no unexpected deviations from the laws proven by experience for voltages to 165 kv. will occur at 220 kv.

The fundamentals of transmission line performance were developed by Frank G. Baum when the first 60-kv. lines were constructed, and have since been confirmed by experience. The performance of a 220-kv. electric transmission line is no less certain than the performance of a water main larger than any now in use.

Energy at high voltage is made possible by the alternating current transformer. The work of C. L. Fortescue, W. S. Moody, and others has advanced the science of transformer design to a point such that transformers for 220 kv. are not less safe than if built for 110 kv.

Insulators suitable for the higher voltage have been made possible through the developments in design, and the improvements in the art of manufacturing porcelain that have been made during the past few years by such men as A. O. Austin, W. T. Goddard, E. M. Hewlett and R. C. Jeffery. The investigations of Harris J. Ryan, J. C. Clark, F. W. Peek and others of the performance of insulators when assembled in strings, also of the factors affecting the life of the units, have given assurance that no unexpected difficulties with insulators will mar the performance of the 220-kv. lines.

All the parts of a 220-kv. system must be in proportion to its large carrying capacity of 125,000 kw. per circuit. Large generating units are required, large transformers, large conductors and large towers. And yet where the load to be carried is in proportion to its capacity, the cost of transmission per kilowatt mile is about one-half the cost of 110-kv. transmission.


COMMISSION OF CONSERVATION, CANADA
MERIDIAN DISTRICT
CENTRAL ELECTRIC STATIONS
Hydraulic (h.p.)
Steam (h.p.)
Internal Combustion
TOTAL WATER-POWER (h.p.)
60 – 65 1,496 23,502 777 520,800
65 – 70 13,346 19,131 1,298 942,200
70 – 75 598,465 36,325 253 3,680,000
75 – 80 686,661 57,954 228 4,320,000
80 – 85 112,183 8,135 2,117 1,640,000
85 – 90 36,088 5 0 250,000
90 – 95 11,800 250 6 1,227,000
95 – 100 78,550 23,169 0 1,743,348
100 – 105 0 9,979 3,161 228,500
105 – 110 0 17,278 1,531 83,000
110 – 115 31,988 50,835 1,332 406,000
115 – 120 48,634 5,603 1,528 944,000
120 – 125 187,420 32,040 785 1,185,000
125 – Int. Bdy. 37,075 10,051 0 1,135,000
Total 1,836,818 288,252 12,923 15,832,000
The diagrams show the aggregate capacity of the central station plants in the various areas, each of which includes five degrees of longitude. Thus, the most easterly indicates the capacity of such plants in Canada between long. 60° W. and 65° W.; the second the capacity of plants between long. 65° W. and 70° W. etc.
They also show the total water-power developed and undeveloped in same areas
The diagrams showing developed water-power indicate the great importance of St. Maurice, St. Lawrence and Niagara Powers
It should be noted that the figures in the Total Water-Power column in this diagram, are the estimated amounts of 24-hour low-water power; and that these amounts can be much increased, the increase depending upon the amount of artificial storage available, the economic head that may be developed and the nature of the industries utilising the power
Total Water-Power, developed and undeveloped
Hydraulic Plants, Capacity
Steam and Internal Combustion Plants, Capacity
Vertical Scale, 1 inch = 1,000,000 h.p.
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
HUDSON BAY
ONTARIO
QUEBEC
Edmonton
Calgary
Regina
Winnipeg
Vancouver
Victoria
Ottawa
Montreal
Quebec
N.B.
N.S.
P.E.I.
Lake Superior
Lake Huron
Lake Erie
Lake Ontario
Note
The above diagrams include the water-power between long. 125° and the boundary between Canada and Alaska
125
120
115
110
105
100
95
90
85
80
75
70
65
60

DEVELOPMENT OF WATER POWER IN CANADA

Canada is now said to possess the greatest per capita water power development of any country in the world except Norway. According to a recent survey made by the Bankers Trust Company, Canada, with 19,500,000 hp. in water power available, has a per capita development of .26 hp. compared with .54 hp. for Norway and .07 hp. for the United States. The states west of the Rocky Mountains in the United States and Canada, moreover, lead all sections of the western hemisphere in concentrated development, installed capacity in this region reaching approximately .3 hp. per capita, with tremendous additional construction under way. The United States leads the world in potential and developed water power resources and Canada comes next. Of the developed water power of Canada, about 78 per cent is used for municipal purposes, about 14 per cent for the pulp and paper business and about 8 per cent for electro-chemical or similar processes.

The very large hydraulic turbines required have been perfected under the skillful guidance of such men as E. C. Hutchinson, H. B. Taylor and W. M. White, and the correspondingly large generators have been developed by W. J. Foster, F. D. Newberry and R. B. Williamson. Credit should also be given to J. P. Jollyman for constructive work along lines of practical transmission and power plant design.

A large high capacity system presents a complex operating problem, especially when it becomes a part of a huge inter-connected network, and the work of such men as P. M. Downing has shown that a carefully trained organization can handle such a system with every assurance of success.

While the success of 220-kv. transmission is assured from every technical standpoint, it would not have been undertaken had not the growth of the demand for electrical energy been sufficient to justify projects running into the hundreds of thousands of kilowatts. The wonderful growth of the Pacific Gas & Electric Company and of the Southern California Edison Company, under the masterful guidance of John A. Britton and R. H. Ballard, has made 220-kv. transmission economically possible. The courage and foresight of F. G. Baum and H. A. Barre, the technical advisers of these companies, in their recommendation for 220-kv. transmission, has led to its adoption as the transmission voltage of the Pacific Gas & Electric Company's Pit River project now under construction, and as the ultimate voltage for the Southern California Edison Company's Big Creek project.

Achievements such as these have set a standard for the West, and work now under way gives assurance that in hydroelectric development the West is building a future worthy of its traditions.

New Utility Commissioners in the West

The refusal of Governor W. D. Stephens to reappoint Commissioner E. O. Edgerton of the California Railroad Commission has created a distinct sensation, not only in the West but throughout the nation. Mr. Edgerton, in his more recent utterances, has undoubtedly voiced some of the most helpful principles in utility evolution in this generation, and he has come to be generally regarded as a real influence in the work of unlocking the great water power resources of the West, thus making industry possible and assuring the continued growth of this enterprising region.

As to what all the behind-the-scenes discussion may have been that led to Mr. Edgerton's non-reappointment, we are in great measure ignorant.

It would seem that some force beyond the hand of the Governor is at work in this decision, and we regret that so excellent a public servant as Mr. Edgerton has proved himself to be, should thus be deprived of expression in perhaps the most important branch of public life that exists today. Citizens generally will look with a frown of disapproval upon the action of Governor Stephens in thus removing so splendid a citizen as Mr. Edgerton from a sphere of action for which he has proved himself so eminently well fitted.

There is, however, a silver lining to the cloud that would for the moment threaten to obscure the vision of growth of the West, and that is that the new appointee, Mr. Chester H. Rowell, former editor of the Fresno Republican, is generally recognized as a man of unquestioned ability, and his reliability in caring for the cause of the general public with fairness to all parties concerned is well known. It is with unusual interest, therefore, that followers of the trend of utility development of the West will await the expression of his views, and the policy he may institute in his work on the California Railroad Commission.

Extending the Self Interest Story

The need for figures such as those worked out by A. E. Wishon on the relationship between agricultural and industrial investment and electrical development has been shown by the extent to which these figures have been used. Power companies the country over have told the "self-interest story" in their advertising, using Fresno data as the basis for their computations—and the number of agricultural customers who have had to wait on account of last year's power shortage in the San Joaquin Valley is familiar to those who attend electrical conventions the country over. Another analysis along similar lines is that of J. M. Morris which was published in the November 15th Journal of Electricity.

These are real contributions to the good will campaign which is being more and more recognized as the foundation of power company prosperity. These figures confine themselves largely to agricultural communities, however, and are particularly applicable to the use of companies who contemplate active construction work and wish to promote their financing. Further figures are needed to meet the needs of companies outside of irrigation districts and those which are concerned chiefly with the normal increase of population and the expenditure which must be made to meet it. How much capital investment is required to supply the requirements of one customer and what will be the additional investment required to meet the needs of a given anticipated increase in population for the coming year, or ten years? Such figures will be understood by Chambers of Commerce and business men and will better their attitude toward adequate rate allowances and other features of power company welfare which are dependent upon public good will. There are any number of figures which would prove helpful and illuminating. If any power company has worked out such statistics, it could not make a better contribution to the welfare of the electrical industry than to make them public for the use of others who may not have the records or the facilities for building such data.

Educational Advantages of N. E. L. A.

In the advertisements of certain of the correspondence schools, the idea is brought out that the boss is watching the man who studies after hours. This is a well known truth because the boss is where he is on account of his ability to find out things like that, and to judge men.

Membership in the National Electric Light Association means three dollars per year to the man, but it actually costs the association ten dollars to send the man his monthly bulletin and his copy of the proceedings at the convention.

The N. E. L. A. Bulletin contains a wealth of information each month for men in all branches of the industry, and if a man desires to keep up with the latest developments in the industry he must not only take it but read it. The papers presented at the convention represent the best thought of the leaders in the electrical industry in this country.

The deficit between the actual cost of membership and the annual dues is made up by the member companies who feel that their employes who join in active N. E. L. A. work are receiving this benefit. The boss knows those who are taking an active part in association affairs, and undoubtedly is keeping his eye upon those men. If not, he should do so, as there should be a reward for any effort which tends to make a man better fitted for the position next above him. And that is exactly what is accomplished by participation in N. E. L. A. activities.

The Utterances of Vice-President Coolidge

"More business in government and less government in business" was the striking philosophy announced by Governor Coolidge in his recent address before the Business Men's Republican Club at the Hotel Biltmore in New York City during December. Governor Coolidge, soon to be our vice-president, enunciated this principle as his interpretation of the desire of the American people to see American institutions restored. He most emphatically brought out his views that the cancellation of orders on every hand, due to fear that action might cost something on the part of the buying American public, displayed a very low moral sense on the part of our people at the present time. These obligations, he said, should be enforced even if enterprises involved did not prove profitable ventures. No such thing as divorcing economic success and moral requirements, in Governor Coolidge's opinion, is possible of attainment.

In the opinion of the Journal of Electricity, a great deal of patience must be shown by all parties to the present issue, throughout the nation. It must be remembered, moreover, that manufacturers gen-

erally profited to a great extent when prices rose, and as a consequence it must not be expected that during the readjustment period everything can be accomplished without some losses — some falling back, as it were, upon the sinking fund which the wise investor put aside during the period of rising prices and industrial activity.

Electrical Shows and the Public

A properly conducted electrical show, planned and carried out by a cooperative movement embracing all branches of the industry, can accomplish a great deal in securing the good will of the public. It will have the effect of placing the industry in a different light with most people who think of the power companies as composing the industry, not thinking of it as a legitimate industry with its many ramifications. Such an exhibition has a good effect upon the members of the industry itself as they are brought closer together, and in many ways should prove useful in justifying a cooperative movement.

The electrical show recently held by the Vancouver Cooperative Association was a great success and has proved to be a big help to the newly formed cooperative movement. Besides this, it has had the effect of adding to the dignity of the industry in that section, as the show was put over in a big way with beautifully designed exhibits, arranged by an architect, which made it more than a mere commercial display. Such a scheme could well be tried in the sections which are starting cooperative movements, and particularly at this time when the electrical dealer must buckle down and sell with the confidence that his market still holds.

Ampere, the Private Citizen

Those who had the good fortune to attend the centenary celebration in honor of the discovery of Ampere's Law, which was held at Ampere, New Jersey, under the auspices of the Crocker-Wheeler Company during December, were most profoundly impressed with one very vital fact; namely, how little we know of the private lives of those great men who have contributed so much to scientific and engineering advance. Professor Pupin of Columbia University ably presented the leading address at this celebration. While he paid a glowing tribute to the wonderful genius of Ampere in the discovery of Ampere's Law, and its mathematical establishment within one week after the famous experiment of Oersted had been presented at Paris a hundred years ago, still his description of the driving vision of Ampere's private life will ever linger in the minds of those who had the privilege of hearing him. Among these Ampere will long be recalled as the son of a father who was guillotined during the French Revolution; as a husband, endeavoring year after year to support a wife sick with a fatal malady, and finding his success in life marred later by the death of his wife at the very instant when he seemed to have reached the summit of material attainment. And then they will follow in memory the description of Ampere's meeting with Sir Humphrey Davy and the encouragement and enthusiasm instilled into his life by this great and wonderful scientist. Unquestionably it was this which actually brought about Ampere's lasting contribution to science in the deduction of the fundamental law that makes possible the establishment of electrodynamics as we know it today.

The thought then comes to us, as we contemplate this life of Ampere, of how little we know of

A HUNDRED MILLION DOLLAR INDUSTRY

Industrial development in the West is no mere artificial growth dependent for its development upon war conditions or a period of abnormal prosperity—it is the normal consequence of western production of raw products, building upon a sound basis of both supply and demand. According to a recent report made by the president of the California Packing Company, the value of the 1920 pack of canned fruits in California alone was $108,000,000. This falls into the same class with fruit drying and packing industries, seed production, fish canning and the like—which, taken all together, form the backbone of a tremendous industrial development in the preparation of food products alone, and one in which electricity plays a basic role.

the private lives of those who have given so much to science and engineering. Could we not all do more individually to bring to light these great and noble lives in the world of engineering, and perpetuate this phase of the human side of things? While we should of course always admire and revere the genius and physical accomplishments of these men, still that better part which must ever go with true genius might well be given the emphasis it was accorded by Professor Pupin at the Ampere centenary celebration last December.

Progress of the Electrical Home Campaign

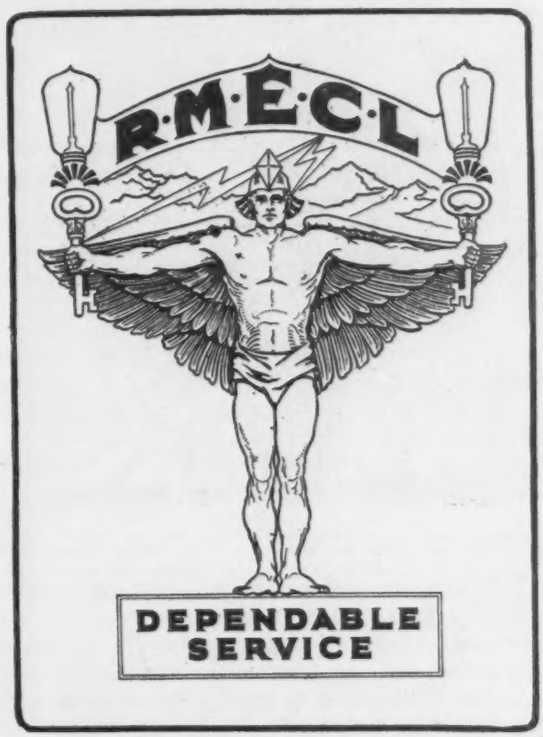
New Year resolutions in the electrical industry include definite plans for the continuation, without interruption, of the electrical home campaign. A survey of the results achieved during 1920 reveals this campaign as one of the most constructive pieces of work ever undertaken by the industry as a whole. Beginning with June 11, the date of the opening of the San Francisco electrical home, four of these homes were exhibited in California during the latter half of the year. The other three, located at Sacramento, Oakland, and Los Angeles, were opened for inspection on July 31, August 26, and November 12 respectively, for a period of about two weeks each. The four homes were viewed altogether by some seventy-nine thousand visitors, many of them prospective builders of new homes. All these were exposed to the convenience outlet idea in its most potent form—that of the actual working installation.

The immediate result of this publicity in a community has been an increased demand for convenience outlets, and this in turn is normally followed by larger sales of electrical household appliances, and an increased use of power. A notable interest on the part of architects and builders has greatly added to the efficacy of the work.

The results achieved have emphasized another aspect of the electrical home campaign which is perhaps equally as important as its publicity value. This is its promotion of the cooperative spirit within the industry. The San Francisco home, the Oakland home, and the Sacramento home were exhibited under the auspices of the San Francisco Electrical Development League, the East Bay Electrical Trades Association, and the Sacramento Electrical Contractors and Dealers' Association, respectively, with assistance from the California Electrical Cooperative Campaign. The Los Angeles home was under the direct supervision of the Campaign representatives. All branches of the industry cooperated both in equipping the homes and advertising them, and the work brought out as nothing else could, the community of interest of the different branches.

The convenience outlet has been recognized as a fundamental business builder for the entire electrical industry, and the electrical home has proved itself the most concrete and effective means of disseminating the convenience outlet idea.

EMBLEM FOR ROCKY MOUNTAIN ELECTRICAL CO-OPERATIVE LEAGUE



As the result of a prize contest for a design which could be used on letter heads and for advertising purposes by the Rocky Mountain Electrical Development League, the above drawing by Miss Florence Truelson of Salt Lake City has been chosen as best expressing the scope and aims of the League. The contest had been extensively advertised in the newspapers of that district and the award was likewise featured in a short article pointing out the appropriateness of the symbolism which expressed the cooperation between manufacturer, jobber, dealer, contractor and central station in the interest of dependable service to the public, which the League is designed to foster. This is in line with the publicity campaign outlined by this intermountain cooperative movement, which will keep the public in touch with the constructive work which the League is carrying on in its behalf, as well as educate it in an understanding of the service of the electrical industry as a whole.

THE NEW JOURNAL SERVICE

The February first issue will contain important announcements regarding the 1921 policy of the Journal of Electricity and its enlarged plans for service to the electrical and industrial West, which will be of the greatest interest to our readers.

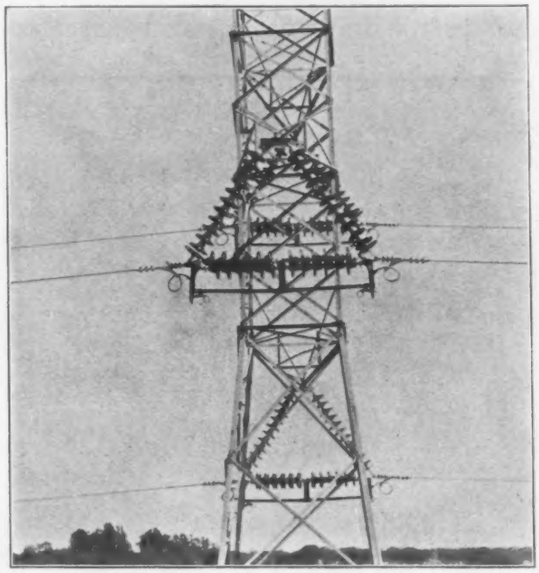
The issue will also commemorate the thirty-fifth year of the Journal's work, and will contain extra pages and a number of special features.

A New Record in High Tension Transmission

BY JOHN A. KOONTZ

(One hundred and sixty-five thousand volts, the highest transmission voltage so far attained, will make the new Caribou line, which is to be put into operation this month, a landmark in engineering. The features of the line are here described in detail by the electrical engineer for the Great Western Power Company of California.—The Editor.)

The Great Western Power Company of California is just finishing its first 165,000-volt transmission line, extending from the Oakland bay district to the Caribou Power House in the Feather River Canyon.



Line section switch for testing. These switches are installed at intervals throughout the line so that any section can be cut out in case of trouble.

This line can best be treated in three sections, namely, the Feather River Canyon or mountain section extending from the plant to Oroville, a distance of fifty miles; the Valley section extending from Oroville to the Vallejo side of the Carquinez Straits opposite Crockett, a distance of 136 miles, and the Carquinez span.

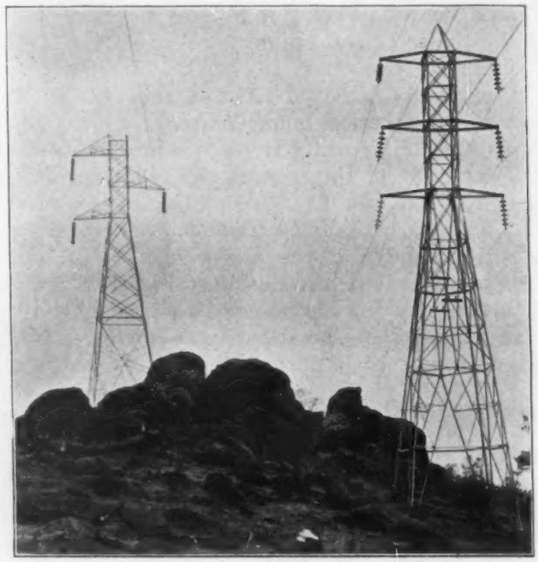
Length of Spans

In the mountain section, on account of the sleet and snow, the conductors are placed on approximately 17-ft. centers in a horizontal plane. The necessity of horizontal rather than vertical arrangement of conductors was very clearly shown in a recent sleet and snow storm, when at one place it would have been necessary to use at least 40-ft. vertical spacing to prevent contact due to heavy sleet and snow loading on one wire, and the load dropping off the other wires in this particular span but remaining in adjacent spans. The section on which this extreme sag change was observed was only about 4,000 feet between dead-end points, but this section contained a couple of 1000-ft. spans. It can be readily visualized that with long insulator strings, such as are necessary at high voltage, the suspension strings will readily swing, to allow a change in wire length, on a loaded span of from 6 to 8 ft., which will give a very large sag in most spans. On account of this sag condition and the heavy loadings involved, the length of span in the mountain section was limited to 1500 ft., and towers have been set even where slight uplifts occur under cold weather conditions, just to eliminate long spans.

In the valley section, the tower designers were able to obtain the required strength with less metal when using a triangular conductor arrangement with two wires on one side of the tower spaced 14 ft. apart on a vertical plane, and the third spaced midway between these two, but on the opposite side of the tower, giving an isosceles triangle with apex at the single conductor, this triangle having an altitude of 20 feet and a base of 14 feet.

Conductors

It was most economical to use steel core aluminum conductors, using a 37 strand cable consisting of 7 strands of steel and 30 strands of aluminum. The generating station being loaded at an altitude of 3,000 feet, it was necessary to use a .861-in. diameter cable for the mountain section near the generating plant for 50 miles of the line, while in the valley section the conductor was of the same composition but .741-in. diameter. This change in diameter was necessary to eliminate corona losses, as it was felt desirable to work the conductor below any visual corona under fair weather conditions. The galvanized steel core used in the cable has ample strength

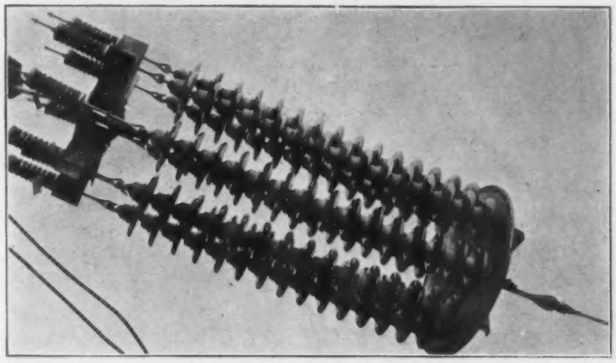


On the right the double circuit 110,000-volt Las Plumas line of the Great Western Power Company, and on the left a valley type tower on the single circuit 165,000-volt Caribou line.

to take care of all load conditions imposed below its elastic limit, independent of the aluminum.

The splices used consist of a steel McIntyre sleeve which connects the steel core together for

mechanical strength; then an aluminum sleeve is placed over this steel McIntyre and the aluminum sleeve is pressed on to the cable by an hydraulic press, thus insuring a good contact. This whole joint might seem difficult to make, but it can actually be made up in the field in less time than a 3/0 7-strand copper cable could be spliced.



Carquinez span insulator. Conductors on the Carquinez span are supported at each end by dead-end insulators made of a group of eight strings of fifteen standard units yoked together. One unit can easily be changed when necessary as the other seven strings will support the conductor.

Insulators

The insulator problem is one that presents numerous difficulties when dealing with high voltage lines. The two most prominent factors to be taken care of are those of voltage distribution on the individual units on a long suspension string, and the mechanical loading at anchor points.

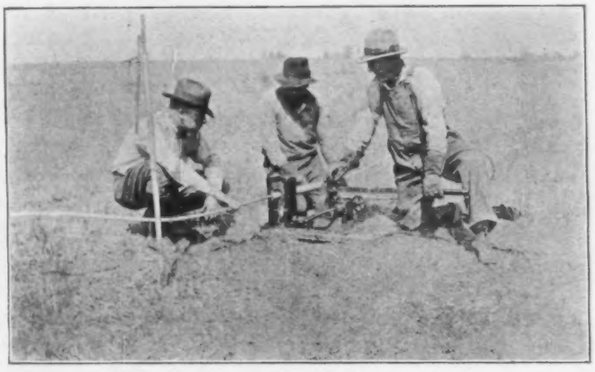
It was evident to the writer some four years ago that if we were to go on increasing the voltage, some system of grading the suspension insulator units would be necessary, as when you are dealing with long strings the adding of additional units to a string will not lessen the voltage duty of those units next the conductor unless such units are firing with corona, and this corona condition is one which I believe every engineer tries to avoid in practice for a number of reasons—the chief and most important reason being that this corona furnishes a source of free ionization which might cause flash-overs.

Under the direction and guidance of Professor Ryan, of Stanford University, numerous experiments were made showing the results that could be obtained by using metallic plates and guards on the conductor and the units adjacent to the conductor which were taking excessive voltage duty. By the use of proper form and size of guards or plates it was found that the voltage duty of the individual units could be changed from a ratio of about 7 to 1 to that of approximately 2 to 1.

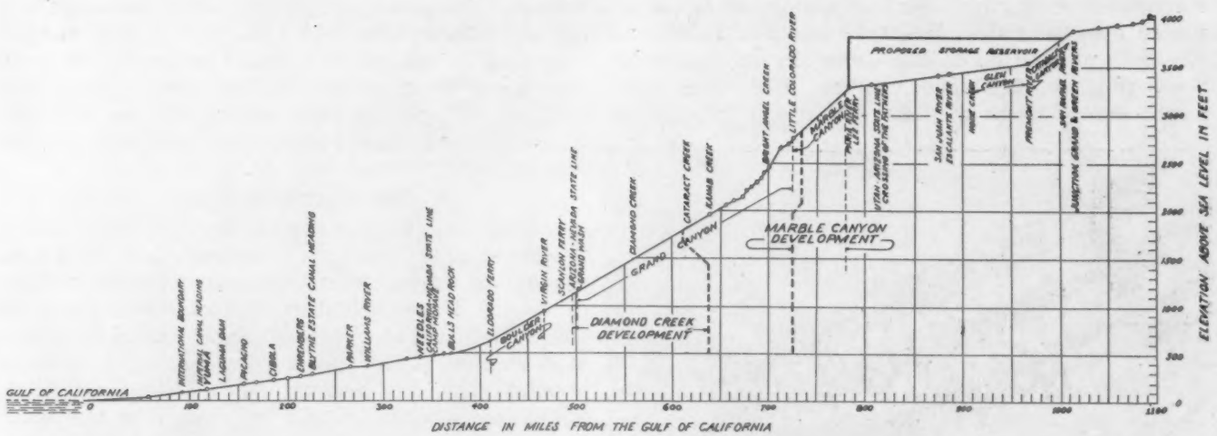
On the present 165-kv. line, after numerous schemes were tried it was finally decided to use only a 12-in. plate or "static shield" between the bottom unit of the string and the wire or hardware attachment. The introduction of this shield in a string of 10-in. short coupled units—5-in. hanging distance or 50-in. string length,—gave a reduction in voltage duty on the first unit from 19 to 14 kv. working duty and eliminated all corona around the wire clamps and bottom insulator, even at 50 per cent above normal voltage. By increasing the size of the shield or adding additional plates along the string, still further reduction in voltage duty could be made, but from past operating experience at low voltage it was felt that the voltages involved were within the safe limits and no additional reduction in unit voltage duty was required.

The Carquinez Span

The 4753-ft. span across the Carquinez Straits presented quite a problem electrically, viz., to get an economical conductor and insulators for the voltage of the line. The combination conductor finally selected was a 61-strand steel core aluminum cable composed of 37 strands of galvanized plow steel and 24 strands of aluminum. On account of the extremely high power losses when using plow steel as a conductor it was cheaper to supply aluminum to carry the current and use the steel simply for mechanical support. The conductors are supported at each end by dead-end insulators made of a group of 8 strings of 15 standard units yoked together. This combined insulator has the appearance of a large squirrel cage—the eight strings of 15 units terminate in a large steel spider on both ends, out of the center of which is brought large eye-bolts to which the steel socket on the cable connects on one end and the pin connection on the supporting tower at the other. On the conductor end there is a circular plate, around the edge of which is welded a ¾-in. pipe to act as a corona shield and voltage distributor over the insulator strings. On the opposite end each of the eight individual strings is supported on a coil spring. These strings were carefully selected and adjusted so that the loads are equalized, and if it is necessary to change a unit at any time, this can be done easily as the other seven strings will readily support the conductor. This type of insulator was selected because it could be readily tested, and defective units changed. The units used were standard for the whole line. This type of insulator gives a flexible unit so that the vibration in the conductor at the point of support is a minimum, as the whole insulator is free to vibrate, and the spring support tends to reduce the vibration. The normal load on the insulator is 16,000 lb. and it is figured to take a 22,000-lb. load under extreme wind conditions.



Making a splice. The splices used consist of a steel McIntyre sleeve which connects the steel core together for mechanical strength, and an aluminum sleeve placed over the steel and pressed on to the cable by an hydraulic press, thus insuring good contact.


PROPOSED STORAGE RESERVOIR
MARBLE CANYON DEVELOPMENT
DIAMOND CREEK DEVELOPMENT
GULF OF CALIFORNIA
DISTANCE IN MILES FROM THE GULF OF CALIFORNIA
ELEVATION ABOVE SEA LEVEL IN FEET

The above profile displays the location of the proposed 200-mile storage reservoir, extending from Paria river to the head of Cataract canyon. The ultimate developments will make more than 400 miles of the river navigable. The Colorado has an annual run-off of 15,000,000 acre feet, of which ninety-three per cent will be impounded.

Gigantic Colorado River Project

(The development of this great river of the Southwest, and the vast undeveloped territory that is tributary to it, means the probable electrification of four transcontinental railroad lines, the irrigation of millions of acres of arid lands, and an increase in the community wealth equal to the present valuation of the state of California.—The Editor.)

An increase of available horsepower, equal to one-half of the total hydroelectric energy now generated in the entire United States is involved in the ultimate plans of the Southern California Edison Company in connection with their proposed Colorado River project. An application for a preliminary permit to develop this energy from the waters of the Colorado river has recently been accepted by the Federal Power Commission.

The Colorado river is considered the second largest river system in the United States and is unique among the important waterways of the world in its adaptability to control for the four-fold purpose of flood prevention, irrigation, navigation and power development. The Colorado drains a watershed of 250,000 square miles and has an annual run-off of 16,000,000 acre-feet.

What is needed for the entire Southwest is electric energy to take the place of the exhaustible supplies of fuel oil. Its development is essential to

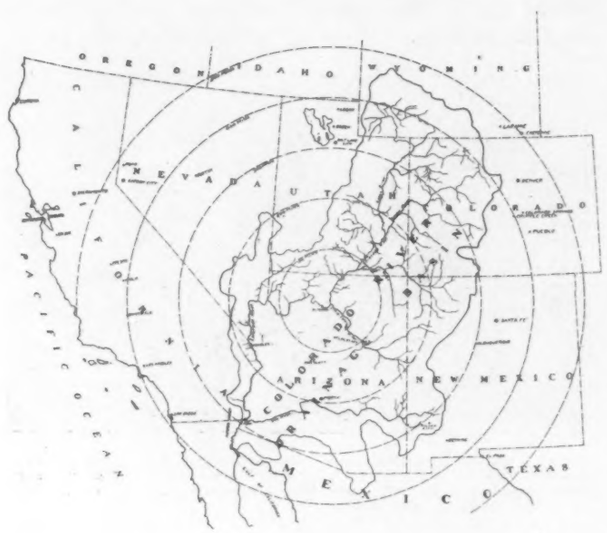


Chart showing the proposed distribution radius. The population of this area was 5,500,000 in 1920, comprising but five per cent of the total population of the United States.

POSSIBILITIES OF COLORADO RIVER POWER PROJECT

1. Three thousand feet of waterfall will produce 4,350,000 horsepower, which is equal to one-half of the total hydroelectric power now generated in the entire United States.

2. Flood control will be absolute, reducing the water discharged to that volume which may be safely carried within the natural banks, levees being practically eliminated.

3. Provision will be made for irrigation of an additional 3,250,000 acres, of which one million acres will be above the canyons and the balance below.

4. The storage basin will be over 200 miles in length, impounding more than 40,000,000 acre-feet of water.

5. Four hundred miles of the river will be made navigable.

6. The area which may be served with power includes three-quarters of the state of California, the entire states of Arizona, Nevada and Utah, more than one-half of Colorado and New Mexico and one-fifth of Idaho and Wyoming, with possibly large areas in northern Mexico.

7. Power may be used for the electrification of steam railroads, as well as for commercial agriculture, mining and municipal uses in the entire district. The saving in fuel oil by the substitution of this hydroelectric power will amount to 90,000,000 bbls. per year, which is practically the present annual production of the entire state of California.

8. These savings in oil consumption will indefinitely extend the fuel life of our navy and merchant marine, which during the war were of necessity changed from coal to oil burning.

9. The Colorado river is the second **largest river** system of the country, having a drainage area of 250,000 square miles. Nature's arrangement of this stream for man's use is equaled by no other river in the world.

10. Ninety-three per cent of the run-off may be impounded above the storage dam, which will be 500 ft. in height.

11. The increase in community wealth by this development will be equal to the total valuation of California for the year 1920.

One of the many tributaries of the Colorado river which will form part of the immense storage reservoir when the proposed dam is constructed. The proposed activities do not contemplate any development work in the National Park.

great areas which are irrigated by pumping from underground flow, and whose only hope for security is the Colorado. To develop an equivalent amount of power by plants using oil for fuel would require more than 90,000,000 barrels of oil, practically the present production in California.

An important feature of the project is the establishment of a uniform flow of the Colorado river, which would practically eliminate the destructive seasonal floods. The present irrigable capacity of the river without storage is 750,000 acres. Storage regulation would allow an increase of 3,000,000 acres. The storage basin would be more than 200 miles in length, impounding more than 40,000,000 acre-feet of water.

The application contemplates the development of power on the Colorado river above the Bowlder Canyon project, at Marble Canyon and Diamond Creek, but does not consider the possible power developments in the Grand Canyon and other sites along the National Park.

The fact that the creation and installation of a project involving the construction of a dam 150 feet higher than the highest dam in the world, impounding approximately fifteen times as much water as the largest known storage of water in the world, with a distributing radius of 500 miles for 2,500,000 horsepower, has received the endorsement of the Southern California Edison Company, is indicative of what we may expect in the way of development in the next decade.

In the districts served by this company, the demand for power has doubled during the last decade. Should the present trend continue it can readily be seen that stupendous projects, of the character of the proposed Colorado River Development of the Southern California Edison Company, will have to be anticipated at once in order to properly meet the inevitable demand.

Since most of the available water power sites in California, capable of developing large amounts of hydroelectric energy have been filed upon, the Colorado region is the logical territory to turn to for the gigantic developments of the next generation.

COMPARISON OF THE PROPOSED COLORADO RIVER DAM WITH THE PRESENT GREAT DAMS OF THE WEST

Dam	Location	Height	Storage
Elephant Butte	New Mexico	318 ft.	2,638,836 acre-feet
Arrow Rock	Idaho	438 "	280,000 " "
Roosevelt	Arizona	280 "	1,367,300 " "
Colorado (proposed)	Arizona	500 "	40,000,000 " "

Transmission Records—Past, Present and Future

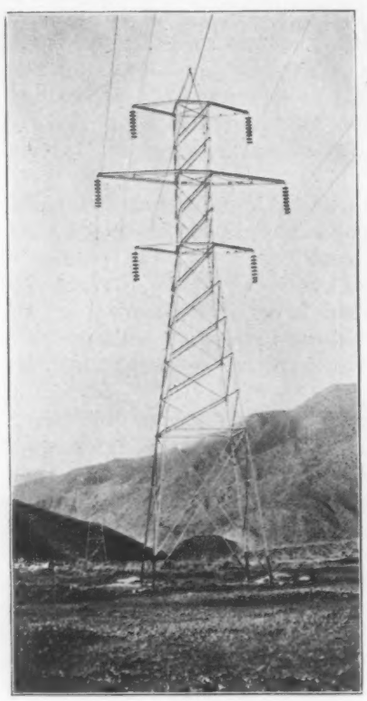
(World's records in long distance high tension transmission have always been a distinctive feature of electrical development in the West. Immense stretches of mountainous country lying between the great water sources and the industrial centers have challenged engineering skill and enterprise in the West with the striking results indicated in these pictures.—The Editor.)

150,000 VOLTS

The high voltage transmission lines on the Southern California Edison Company's Big Creek system operate at 150,000 volts over a distance of 241 miles. These were the first commercial transmission lines in the world to be operated at a potential as high as this. A thirty-mile stretch is to be changed over to 220,000 volts, with a view ultimately to raising the voltage of the entire line.

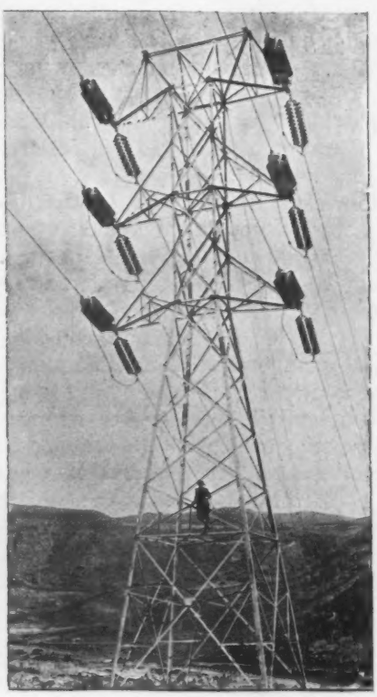
220,000 VOLTS

The record made by the new Caribou line will in turn be broken by the 220,000-volt transmission system to be constructed by the Pacific Gas & Electric Company in connection with its Pit River development. The above picture shows the right of way clearance, construction work on both power house and transmission line having already been begun. The line will be over 200 miles in length.



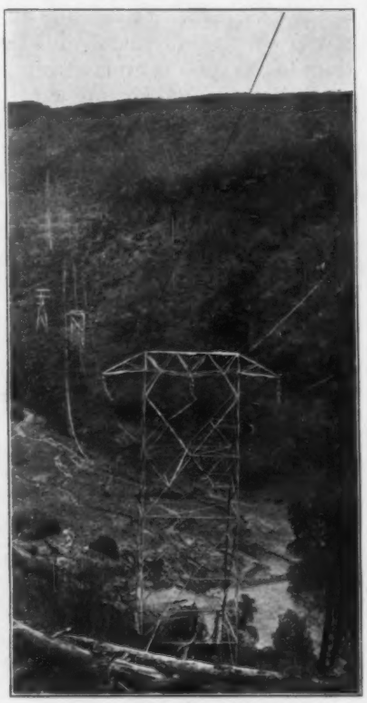
60,000 VOLTS

The Yuma-Wonder line of the Southern Sierras Power Company, a section of which is shown above, holds the record for long-distance transmission, carrying power at 60,000 volts across a stretch of 536 miles of mountain and desert country in Arizona, California and Nevada.



130,000 VOLTS

A terminal on the 130,000-volt line of the Utah Power & Light Company, showing the heavy anchor tower and quadruple strain used for long spans. High tension transmission over long distances has always been an outstanding feature of Western hydroelectric development.



165,000 VOLTS

The new 165,000-volt line just being completed by the Great Western Power Company of California will make a new world's record in high voltage transmission this month. It extends 190 miles, from the Caribou power house on the Feather River to San Francisco Bay.

New Transmission Line in Idaho

BY C. O. CRANE

(Extensive irrigation in the inter-mountain district has made heavy demands on the power supply of the Idaho Power Company. A new transmission line to improve distribution facilities is here described by the engineer in charge of all the electrical construction work of the company.—The Editor.)

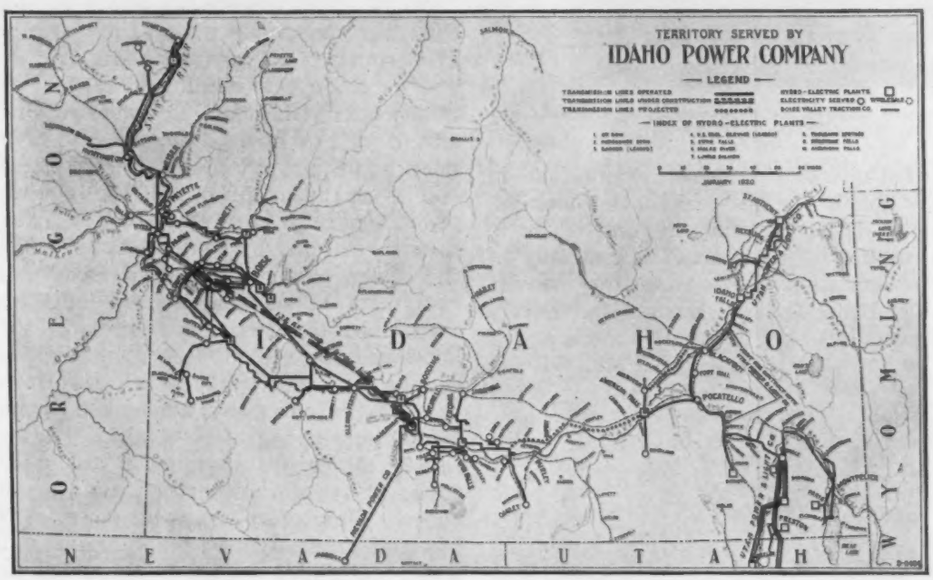
The line now under construction between Thousand Springs and Caldwell will be approximately 115 miles in length, extending from the Thousand Springs power station through Twin Falls, Owyhee, Elmore, Ada and Canyon counties, to and into the city of Caldwell. It is laid out along the shortest feasible route and upon the most practical location. The survey for line location took into consideration the many features that comprise such a project—sound engineering, standards of construction, the least possible effect upon private property, as to persons, lands and improvements, and operating conditions—and in its entire course through the Mountain Home section and through the very heart of the Boise Valley avoids close proximity to buildings, excepting in two unavoidable instances.

Choice of a Location

The location could not reasonably follow section lines because of the many angle turns which would have been necessary, and the greatly increased cost, not only because of the angles, but because of the greater mileage of line construction. It could not be located along highways because of the angling there necessary and also by reason of the fact that the double pole type of line cannot adapt itself to the highway except by "straddling" the property lines, in which instance the line would be in the front yards of the improved places along the route. Such location would make it imperative also that many shade trees be topped, trimmed and possibly removed altogether. It was desirable also to keep as far away from the railroad, with its telephone, signal and other wire lines, as practicable, because of induction troubles; and the same problem was presented by the commercial telephone lines. Taken altogether, the problem of line location was very difficult of solution in many respects.

Line Construction

The new line is a 132-kv. single-circuit, wood-tower transmission line and will be constructed upon a double line of poles placed in parallel, 14 feet apart, the poles being 55 feet in length, and in certain conditions 60 and 65 feet, as, for instance, at river crossings and side hills. They are set into the ground seven feet or more, with spans between poles of about 550 feet, these spans varying in greater or lesser degree to accord with natural and other physical conditions. The cross-arms are 29 feet long with three strings of suspension insulators, spaced 14 feet apart on the cross-arm, each insulator supporting one 4/0 7-strand, steel reinforced, aluminum cable; static, or "sky" wire is not contemplated, but each pole will carry one No. 6 ground wire for lightning protection.



Map showing the transmission system of the Idaho Power Company. The new line under construction is indicated by a double broken line; projected construction by a dotted line.

It is not proposed to have any intermediate substation taking off this line, nor is it intended that any communities along the line will be served from it.

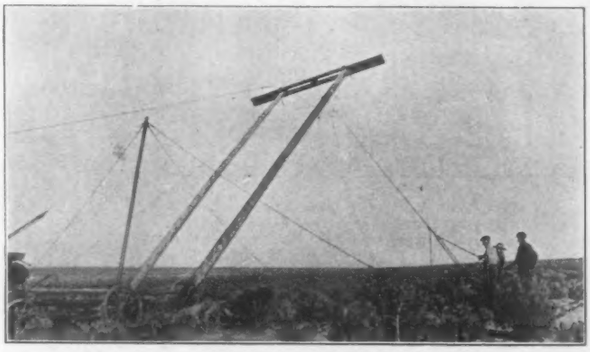
Conditions of Service

The construction of this transmission line was made necessary by the conditions of service which

must be met. Over in the Twin Falls division are the company's heavy producing stations—Thousand Springs, the Lower Salmon Falls and Malad—while

Bolting up on the 132-kv. line. The cross-arms are 29 feet long, with three strings of suspension insulators.

down in the west end of the Boise division, and in the Payette division, is the heaviest service demand, set up largely by irrigation pumping, and which is constantly increasing. This demand is met only in part by the power stations in that territory—Swan Falls, Horseshoe Bend, Oxbow, Barber and Diversion. The company has been transmitting the power from the one end to the other over the Malad-Boise



Putting poles in place. The poles are 55 feet in length and for special locations 60 and 65 feet.

44-kv. line, and so on through, and over the Lower Salmon-Glenns Ferry-Mountain Home-Grand View-Swan Falls-Nampa-Caldwell 44-kv. line, but because of the constantly increasing load, these lines are of inadequate capacity, and it became necessary to provide additional capacity. This is being done by the line now under construction.

Personnel

The construction of the line is under the supervision of Chief Engineer W. H. Trenner. The field construction is being carried on in two divisions, that one from Thousand Springs to a point a little northwest of Mountain Home being in charge of Frank B. Moore, and the west end division, from the last mentioned point into Caldwell, being in charge of G. F. Redman.

HYDROELECTRIC DEVELOPMENT IN NEW ZEALAND

As a part of the program of the government and people of New Zealand to develop their extensive water-power resources, the Southland electricity power board has recently invited tenders for the hydraulic and electrical equipment for two 3,000-kw. units, together with the accessory equipment for the initial installation at the new hydroelectric generating station at Lake Monowai, near Invercargill, Southland, New Zealand, the ultimate capacity of which will require six such units.

It is the intention of the board to sell the power direct to the consumers in the country districts, but boroughs and towns will have the alternative privileges of either buying the power in "bulk" and distributing the supply within their own boundaries or of permitting the power board to distribute the energy as in the country districts. Although the Manchester Guardian Commercial indicates that efforts may be made to have a loan of £1,500,000 to finance this project negotiated in the United Kingdom, with the condition that the required machinery shall be purchased in that country, nevertheless the great experience of United States manufacturers in the design and installation of modern hydroelectric equipment of such large-sized units should enable them to handle the business, provided they make due allowance for the difference in the Australian exchange rates with England and the United States.

At present New Zealand is employing only 50,000 horsepower of its available water power. Of the 21 major installations, 2 are operated by the state, 14 by local authorities, and 5 by private companies. Heretofore the water power of New Zealand has been primarily used for hydraulic mining and for water motors for driving mining machinery.

Recently, however, there has been a rapidly growing appreciation of the economic benefit of developing hydroelectric projects. Last August the minister of public works stated that electricity from water power could economically replace coal to the extent of 1,250,000 tons per annum, which is about half of the Dominion's present annual coal requirements, and make a still further saving by reducing the requirements for firewood and mineral oils. Recently the minister estimated the capital expenditure to carry out the North Island scheme outlined by Mr. Evan Parry in his 1918 report at £10,000,000, while the South Island schemes would involve an equal outlay. These estimates cover expenditures by the government alone in erecting generating stations and transmission lines to the main centers of distribution. New Zealand's increasing population is forcing the Dominion out of the agricultural stage into the industrial stage, and the consequent demand for cheap power has awakened very general interest in developing these water-power projects.

Mineral Conservation by Electricity

BY GERARD B. ROSENBLATT

(Conservation of waste products is another form of increased production, and some of the most important research work of modern times is being directed towards this end. Among discoveries of the greatest benefit to industry is the Cottrell process, here described by an engineer with the Westinghouse Electric & Manufacturing Company.—The Editor.)

Murray Plant of the American Smelting & Refining Company

THE use of electricity in promoting the conservation of this country's mineral wealth is usually associated with the idea of replacing power generated by fuel with hydro-electric power. Another, less considered, avenue of conservation is offered by the direct use of electric power to save mineral values that would otherwise go to waste. The possibilities of this form of conservation warrant more general attention than has been accorded them. Many metallurgical processes that are successfully operated on a commercial basis, waste mineral values that could readily be recovered electrically. This loss can frequently be eliminated or reduced by the application of the Cottrell process of electrical precipitation. The Cottrell process is a direct electrical method of precipitating fine particles carried by a moving column of gas. By its use suspended matter in the shape of dust, or liquid particles in the form of mist, is coalesced and may be saved from the gas stream that would otherwise carry it to waste.

Description of Cottrell Process

The principle involved in the process is as follows: When a gas is ionized and passes through an electrostatic field its ions begin to travel at a high velocity in the direction of one or other of the electrodes causing the field. If the electrodes are charged to a high potential they become the ionizing agents as well as the source of the propelling force. These highly charged ions are continually bombarding any solid particle that may be in the field, and they impart a charge of like potential to such particles, which in turn begin to travel towards the electrode of opposite polarity. Upon reaching the electrode they tend to cling to it and coalesce in quantities that can subsequently be removed when power is shut off and the gas stream interrupted.

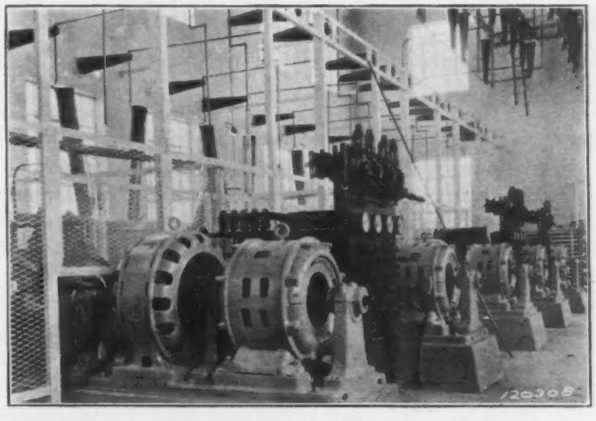
The particles that are caught and coalesced by the above operation are collected from the treater by shutting off electrical power, and rapping both electrodes. The loosened dust is then caught in hoppers at the bottom of the treater, from which it can be removed either by drawing into cars, or by some form of screw conveyor.

Method of Producing High Tension Current

To produce the high static charge on the suspended electrodes, a uni-directional high voltage current of sometimes as high as 100,000 volts d.c. is used. This uni-directional high tension current is produced by rectifying a high tension alternating current. The high tension alternating current is produced by stepping up an ordinary low tension alternating current in transformers especially designed for the purpose.

The rectification of the high tension a.c. is usually accomplished by means of a mechanical commutating switch run in synchronism with the low tension a.c. supply. Other forms of rectifiers not dependent on mechanical commutation have been developed experimentally, but are in general not suitable for commercial installations. These purely electrical rectifiers operate on the principle of an electrical valve, somewhat in the same manner as the Cooper-Hewitt bulb rectifiers, or similar devices, used to produce low tension d.c. from a.c. supply lines.

From the above it will be seen that the essential elements of an installation for saving mineral values by means of electrical precipitation will consist of a treater composed of tubes with suspended electrodes, and electrical equipment for supplying the electrodes with uni-directional high voltage direct current. This electrical equipment consists of a suitable source of



Cottrell equipment at the reduction works of the Anaconda Copper Mining Company. 14—75-kva. 100,000-volt units in this plant.

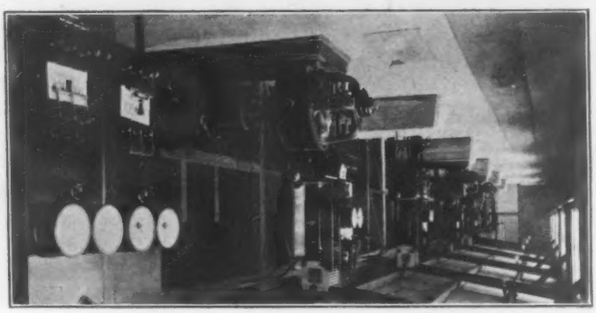
low tension a.c., step-up transformers, and a means of rectifying the high tension a.c. Nothing in the entire layout is essentially complicated.

The process of electrical precipitation is applicable to a great many metallurgical operations which are attended with heavy flue losses. Large savings may be made through the recovery of blast furnace dust in steel mills, and the recovery of potash from the cement dust in many Portland cement plants. The metal losses may be materially reduced by applying the Cottrell process to the roasting of copper ores, the sintering of lead ores, and various types of detinning operations. Some problems are easier to

handle than others, but the waste occasioned by the giving off of fume in any metallurgical process may be very materially reduced by the proper installation of electrical precipitation treaters.

Other Applications of the Cottrell Process

The process has other applications as well. It may be used to precipitate carbon from ordinary smoke and thus abate many smoke nuisances. It has been used to collect lamp black produced in the burning of oil-well residues. It is successfully applied in producing powdered milk, and investigations are now under way towards using it for the production of solidified fruit juices. However, by far the greatest use of the process to date has been to reduce



Installation of the Santa Cruz Portland Cement Company, Davenport, Cal. 15-kva., 100,000-volt units.

waste in metallurgical processes by catching values that would otherwise be lost up the chimney.

The western part of the United States has been foremost in applying electric precipitation on a large scale. Probably the largest installation in the world is at the Anaconda Reduction Works of the Anaconda Copper Mining Company. Here there is a treater installed capable of handling two million cubic feet of gas per minute from which many tons of valuable dust are recovered daily. Other installations of considerable importance which are recovering copper from roaster gases are at the Tacoma Smelting Co. at Tacoma, Washington, the Garfield Smelting Co. at Garfield, Utah, the International Smelting Co. at Miami, Arizona, and the American Smelting & Refining Co. at Hayden, Arizona.

The American Smelting & Refining Company's plants at Murray, Utah, East Helena, Montana, and Durango, Colorado, are using electrical precipitation to recover lead from the fumes of their sintering machines. The Northport Smelter at Northport, Idaho, and the International Smelter at Tooele, Utah, are doing likewise. So is the new smelter of the Bunker Hill & Sullivan M. & C. Co. at Kellogg, Idaho.

At the works of the Selby Smelting & Lead Co., Selby, California, the process is used to recover sulphuric acid mist, while at New Almaden the same process is used to remove foreign matter from mercury vapor and thus insure a pure mercury product in the process of distillation used. A prominent Western cement plant which has just installed an extensive treater for the recovery of potash from their waste gases is the Santa Cruz Portland Cement Co. at Davenport, California.

Extent of Conservation

The total saving in mineral values collected at the treaters in all of the plants listed above runs into many millions of dollars per year, and is a very appreciable factor in conserving metal and mineral values that would otherwise be wasted. Too many millions of valuable metals still go to waste in other plants, a very goodly portion of which could be saved if proper steps to eliminate the loss were taken. Electrical precipitation is not a panacea for eliminating all such losses, but it can be used to good advantage in many cases, not only in smelting plants, but in refineries, foundries, and many industries that are inherently dust or fume producers.

The elimination of such waste as mentioned above can in most instances be shown to be good business. The reduction of dust losses not only abates a nuisance and saves the mineral wealth of the country, but the process of saving, if properly applied, is a money maker. And while in a general way we are all interested in the altruistic motives of public welfare and the conservation of our natural resources, it is the profit which may be earned that obtains major attention when such installations are considered. In many cases the elimination of dust losses can be accomplished most economically with a Cottrell treater. The structural requirements for such a treater are usually not elaborate.

The electrical apparatus while differing in many details from that commonly used for the utilization, transmission, and generation of electric power, is not complicated and has been developed to a point where commercial reliability is assured. In the past the process has been wrapped around with much undue mystery and not accorded the publicity it deserved. However, for many applications its practical commercial installation and operation is comparatively simple, and it has the possibility of effecting real savings which may be measured by monetary standards.

ELECTRICITY IN INDUSTRY

The enormous development of American industries during the past twenty years becomes more apparent when measured in terms of horsepower. Increasing from a half-million horsepower consumed twenty years ago to the striking aggregate of eighteen million horsepower today, the consumption of electrical power has expanded over 3,000 per cent. This is accounted for by the growing use of electrical energy in most industries and the electrification of old plants. Electric motors have been winning universal favor because of the greater advantages of central station service, and the marked economy attending the use of electric motors.

In 1899 electric horsepower equaled only 5 per cent of that for all primary horsepower. Today, that percentage has increased 60 per cent. These salient facts of past developments, when studied with the advancing steps of evolution, afford a working basis for making future estimates. In short, reliable authorities predict that electrical power in 1924 will reach the total of thirty million horsepower.

A Conduit Return Underground Series System

BY N. B. HINSON

(Ornamental street lighting systems have figured conspicuously in electrical development in Pacific Coast cities. The following article describes the special economies of a type of system installed in a residential city of Southern California. The author is distribution engineer with the Southern California Edison Company.—The Editor.)

Typical Beverly Hills boulevard showing ornamental posts

DURING the war period when material was so hard to get and prices high, the installation of ornamental street lighting systems was practically stopped. The city of Beverly Hills, California, had made all its plans for the lighting of the streets some time before this condition arose, and when estimates were furnished later, the cost was so great as to be prohibitive. The city did not want to give up the idea of a new lighting system, as the old one was inadequate, and would have to be rebuilt soon. The proposition was put up to the Southern California Edison Company who were wholesaling energy to this city, to see if there was some way in which the system could be installed at less cost.

The original system called for approximately three hundred and seventy single light ornamental posts each to be equipped with one 250-c.p. Type "C" Mazda lamp, and to be operated on a double schedule with underground consisting of galvanized iron conduit with two conductor 500-volt cambric insulated lead covered cable. The Southern California Edison Company has never favored the installation of high voltage series systems underground, but has preferred to keep the voltage under 750 which is 5 kva. at 6.6 amperes.

Difficulties in Layout of City

The cheapest system that could be installed was No. 8 D.B.R.C. wire in conduit, but the voltage would then have to be limited to six hundred. This was perfectly satisfactory, but the layout of the city introduced other difficulties to a standard system of complete loops. The city of Beverly Hills is a strictly residential city with wide streets and parkways, large lots and beautiful homes. There are no poles on the streets anywhere; in the lower section the lines are on the rear property lines, and in the upper section the whole system is underground. This limited the possible feed points; also the streets are very irregular. If complete loops were made around blocks the voltage would be too high, and there was always an odd number of streets. The city decided it would be satisfactory to have all the lights burn until midnight, and leave the lights on one side of the street only, burning after midnight. This simplified the system to one wire on each side of the street instead of two, but still complete loops could not be made. This led to the suggestion of the use of the conduit as a return conductor.

A Small System Worked Out

About this time a small system of forty-one posts was installed. Each post was equipped with one 100-c.p., 6.6-ampere series lamp, and each side of the street controlled separately; the underground consisting of one-half inch galvanized conduit installed in a loop system from post to post, the conductor being one No. 8 D.B.R.C. New Code wire in the one-half inch circuit. The pipe joints were put together with graphite pipe paste and the ends of conduit bonded together with copper ground strip in the base of each post.

Tests were made before the lamps were installed, with 6.6 amperes flowing at fifty cycles, the standard frequency in Southern California, the voltage drop per thousand feet of conduit with complete copper circuit being 14.2 volts; using the conduit as a common return the drop was 10 volts. The energy loss with complete copper circuit was 32 watts and with conduit return was 45 watts. This showed that with the additional resistance of the one-half inch galvanized conduit in the circuit, the voltage necessary to force 6.6 amperes through the conduit return is less, due to the fact that the reactance of the circuit is reduced by the return current flowing in the conduit around the conductor. This system has been in successful operation for nearly four years.

Details of New Installation

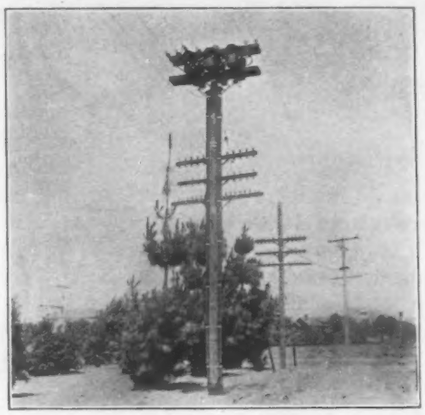
The system at Beverly Hills was then laid out accordingly. There were installed three hundred and sixty-five posts, approximately three hundred feet apart on each side of the street, staggered so that the distance between posts is about 175 feet. Over twenty-one miles of one-half inch conduit was installed. When it came to pulling in the wire in such long runs, three hundred feet on the average, and some as long as four hundred and fifty feet, the ordinary method of fishing could not be used. A small air compresser driver with a gasoline engine was set up on a hand truck with a storage tank similar to the ones used in rural garages. A pneumatic fishing machine with special cord was used, and all the wires fished with air. This has the added advantage of cleaning out the conduit of any foreign material.

The wire was all ordered on reels so that it could be pulled in continuous lengths from the series socket of one post to the series socket of the next. The ends of conduit were bonded together with a punched ground strip, special care being taken to see that the pipe was clean and the connection good. The cast iron posts were also grounded to the conduit.

At the feed points, the conduit was carried up the pole to within four feet of the crossarm and

equipped with a one wire condulet. The conduit was covered with fiber conduit to comply with state law, and where more than one conduit was installed on a pole, as many as three pipes were put in one piece of fiber conduit. At the end of each circuit the wire from the series socket was connected to the conduit in the base of the post. At the feed point the one wire was connected to one terminal of the transformer, and the other transformer terminal connected to the conduit by means of a ground clamp. On this system the maximum voltage of the circuit between conductor and conduit exists only at the feed point and decreases as each lamp is passed to zero voltage at the end. Consequently the strain on the insulation is greatly reduced on the last half of each circuit.

The underground system installed complete, including also the lamps, globes and series sockets, but not the foundations and posts (as these were installed by the Street Department of Beverly Hills), cost approximately thirty-three per cent of the original estimate of lead cable and conduit.



Feed point on the edge of the underground section

There were two methods of feeding to choose from,—primary control wires from the substation, with Type R.O. transformers at the feed points, or constant current transformers in the substation with Type S.L. transformers at the feed points. The cost was about the same, and the latter system was chosen, as it is easier to keep a check on the current regulation and the S.L. transformers occupy less pole space. In one case, six transformers were hung on one pole.

The substation equipment consists of four 25-kva. constant current movable coil regulating transformers; two transformers on the midnight circuits and two on the all night circuits. They are controlled with electrically wound time switches. There are four overhead series circuits feeding twenty S.L. 4-kva. transformers. Each S.L. transformer has a film protective device on the secondary side, so that in case of an open on the secondary circuit, the voltage will not rise to an excessive value. The station equipment is large enough to take care of the additional load when the posts are installed on the remaining streets.

In cases where it was known that extensions would be made from the existing underground system, a length of conduit was installed in the post foundation in the direction of the future extension. Several extensions have been made on the end of circuits. It is only necessary to disconnect the wire from the conduit, splice it on to the new wire extension, and bond again at the end of the new circuit.

Posts have been installed in the circuit between existing posts. The conduit was cut at the point where the new post was to be installed, the wires disconnected from the series socket in the two adjoining posts and pulled out far enough to reach up into the base of the new post, conduit bends put on with running threads on the conduit, and a lock nut, the foundation installed and the post erected. New wire had to be spliced on the old to extend up to the series sockets in both the new and old posts.

Satisfactory Service

It is very easy to locate trouble should any occur, as in case of a ground all the lamps beyond the trouble go out, and in case of an open, by shorting the ends of the wire at the series socket in any post to the cast iron post it is easy to locate the open.

This system has been installed in a number of places where it has been impossible or impracticable on account of the cost to make closed loops. It has even been used where cambric insulated lead covered cable was installed in conduit, and a decided saving could be made over a closed loop system.

This system has been in operation since August, 1917, and not a single case of electrical trouble has ever been experienced.

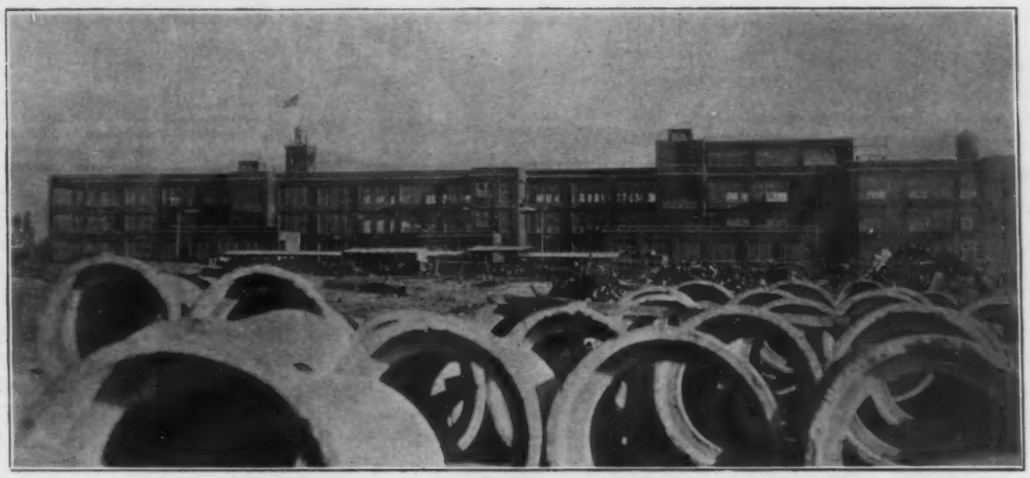
EQUIPMENT OF A CHINESE SHIPYARD

The Kiangnan dockyard is located on the Whangpo river, Shanghai. It is above both the foreign settlement and the native city. In organization it is a Chinese government shipyard, the only one doing commercial construction. Its directorate is Chinese; its technical administration is in the hands of a mixed Chinese-European staff, there being a group of English employes superintending the engineering problems.

The capacity of the plant is very limited, and compared to a modern European shipyard it is antiquated. This fact, however, assumes less importance when we consider what such a plant means to China and Chinese development. The building ways line the Whangpo for several thousand feet and appear to be somewhat hampered for space.

The dry-dock opens onto the Whangpo river, which has 16 feet of water (mean low water) and with tides is materially deeper. It is excavated from the mud which forms the riverside here, terraced up with wooden timbers, and closed by one pontoon laid across the sill. There are outside cranes, and to the north of the dry-dock along the river a large pier of sheer logs for handling boilers, etc.

As far as equipment goes there is a lack of labor-saving devices. The Chinese use the handsaw as they have done for the last thousand years, and within 20 feet of a modern power-driven bandsaw, the hand labor still competing successfully.



One of the largest users of electric power in the West is the new factory of the Goodyear Rubber Company, near Los Angeles, California, recently constructed at a cost of $20,000,000.

Electricity in a California Rubber Factory

BY PHILIP CHAPIN JONES

(Typical of the new industrial development in the West is the large rubber plant recently put into operation in southern California. The extensive electrical drive, the modern illumination and the special safety devices are among the features described here by the electrical engineer for the Goodyear Tire & Rubber Company of California. The new factory is one of the largest single users of electricity west of the Rockies.—The Editor.)

The role which electrical energy plays in the modern commercial article is not often fully appreciated. The Goodyear Tire & Rubber Co. of California—situated at the southern end of the city of Los Angeles—is a good example of an electrified industry. This plant, comprising both cotton and rubber mills, with a present capacity of 5,000 tires a day and a floor area of ten acres, has a connected load of about 10,000 hp., and when it reaches its full capacity will have a monthly consumption of over 3,000,000 kw-hr.

The electric energy used is supplied by the municipal aqueduct system and is delivered to the Goodyear Plant at a pressure of 33,000 volts. This is stepped down by a 6,000-kva. bank of transformers to 2300 volts for distribution throughout the plant. The distribution is all by means of underground ducts, and ample capacity is allowed for expansion to a plant of four times the size of the present unit. Leaving the main sub-station are four separate banks of ducts each containing thirty 4½-inch fibre conduits. The routing of these duct lines and the general building layout is shown in the illustration below.

Electrical Installation

To meet the exigencies of the multiplicity of processes in the manufacture of tires, the Goodyear Company uses electrical energy in four different forms:

(1) 110-volt, 3-phase for lighting, miscellaneous small heating, signal systems, and motors smaller than ½ hp.

(2) 230/115-volt, 3-wire, direct current for motors from 1 hp. to 150 hp. wherever adjustable speed motors are required.

(3) 440-volt, 3-phase, for all constant speed motors from ½ to 75 hp. inclusive, and for heavy heating work.

(4) 2300-volt, 3-phase, for motors from 100 hp. to 750 hp. inclusive.

The division of the load among these different sizes and types of motors is indicated in Table 1. Attention might be directed to the fact that while out of 688 alternating current motors over half (56.4%) are 5 hp. or less, these small motors constitute only 8.9% of the connected alternating current horsepower.

The 2300-volt energy coming from the main transformers is converted to the lower potential at different points. The 110-volt is obtained from 25-kva. transformer banks hung on steel platforms outside the buildings at various points around the plant. There are 13 of these banks altogether in addition to eight 15-kva. banks used for emergency and yard lighting.

The 230/115-volt, 3-wire, direct current comes from two 1000-kva. motor-generator sets in the main substation. The 440-volt is obtained from one 600 and three 1500-kva. transformer banks located at three small substations — one for the cotton mill, one for the rubber mill, and one for the power house and machine shop. The 2300-volt motors are fed by individual circuits from the 2300-volt busses in the small substations.

Rubber-Treating Processes

In order to get a birds-eye view of the many uses to which the motors are put, it may be well to follow the processing of the rubber from its receipt from the plantation to the wrapping of the finished tire. The first step is washing. This is done in wash-

ers consisting of two horizontal, corrugated rolls revolving toward each other so as to draw the rubber in at the top and discharge it from between them at the bottom. Water is played on the rubber as it passes between the rolls and washes out all impurities as the corrugations on the rolls break up the gum. About ten of these washers are geared to a line shaft run about 6 feet above the floor, driven by a 300-hp. motor.

The next process is mixing the washed and dried rubber with the various chemical ingredients which give to it the qualities desired, such as durability for tread stocks, toughness for side walls, etc. Mixing is done in mills consisting of two horizontal, smooth rolls 84 inches long and 22 and 26 inches in diameter. Each roll rotates at the same speed but as they are of different diameters there is a difference in peripheral velocity, with a resulting frictioning effect as the rubber and compounds are drawn in between the rolls. Mixing requires more power than any other single operation. The mills are geared to line shafts running beneath the floor with eight mills on a shaft driven by a 750-hp. motor.

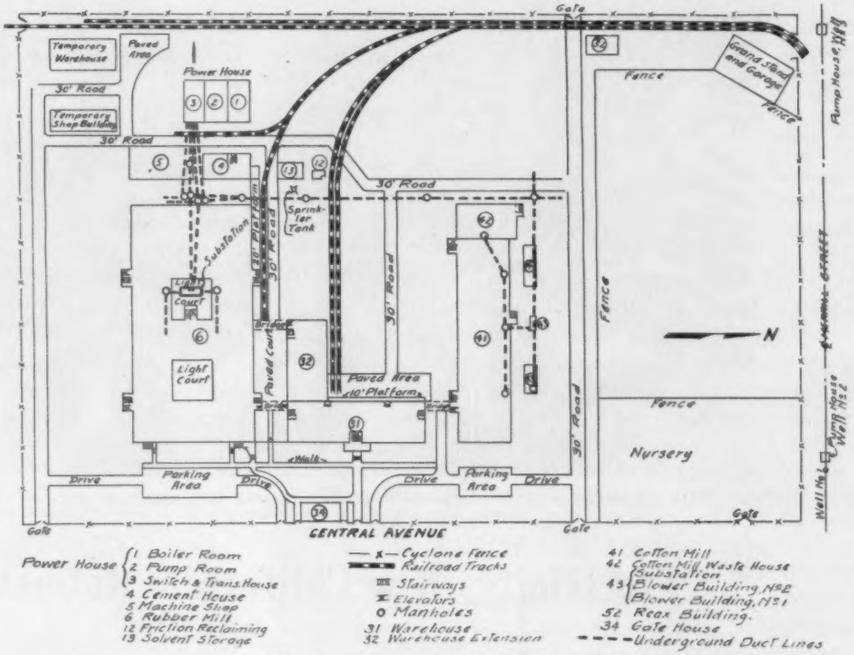


Diagram of general building layout of the plant, indicating electrical distribution plan.

To avoid failure of electric contact when the safety is pulled a sealed in mercury contactor is used which is closed by gravity. The pulling of the safety rope merely releases a latch. To prevent grounds or shorts on the safety circuit from interfering with its operation, a special looped system is employed so that a ground or short will at once shut down the line.

On some of the devices a magnetic clutch is used between the motor and the line which is opened when the safety is pulled. This cuts the motor from the line which enables the brake to stop the line more quickly.

On the calenders the same general scheme of safety contacts is used, but instead of a mechanical brake to stop the motor, the motor armature is disconnected from the line and short circuited, which allows an enormous current to flow through the motor, exerting a torque in an opposite direction. This brings the calender to a stop in a small fraction of a turn.

Special Safety Devices

To guard the operatives from accidents on this heavy machinery every safety precaution possible is taken. Every mill and wash line is equipped with a brake which will stop the line in a few inches of travel of the surface of the rolls. On each side of the mill or washer and a couple of feet above the rolls is stretched a piece of flexible, galvanized steel wire which when pulled makes an electric contact which stops the motor and sets the brake. The position of this wire is such that if a man should reach over far enough to get his hand caught between the rolls, some other part of his body—his other arm or his head—would hit this rope and thus shut down the mill line.

Supplementary Electric Motors

Other uses of the motor may be mentioned more briefly. On the bias cutters which cut the rubberized fabric that comes from the calenders into strips which go into the building of a tire, two motors are used, both direct current: a 1-hp. on the knife which does the cutting, and a 5-hp. on the wind-up which winds up the liner—a light canvas used to separate the layers of rubberized fabric. Due to sticking which often occurs between the liner and the stock, this motor is equipped with an extra heavy series field to give a very heavy torque.

The tire building machines on which the casings are built up are also driven by 1-hp. direct connected motors. These motors operate at two speeds—500

r.p.m. and 80 r.p.m. The low speed is used in pulling the plys on the core and is obtained by a combination of resistances and a special series winding. The bead building machines are driven by motors similar to those used on tire machines.

Note here might also be made of the electric battery driven tractors used for hauling throughout the plant. A complete charging station, including motor-generators and electric still for getting distilled water, is maintained for the operation of these tractors.

Squirrel cage induction motors are used for a great variety of purposes, among which might be mentioned tube building and wrapping, treading, buffing, wrapping tires for second cure, compound mixing and grinding, conveyors, elevators, blowers, vacuum cleaning systems used to clean liners, and practically all the processes in the cotton mill.

Modern Illumination

The lighting of the Goodyear factory is up-to-date in every respect. A maximum of daylight is obtained by running the windows up to the ceiling line and by the use of large (100 ft. square) light courts. Artificial lighting is provided which gives an average illumination of about 5 foot-candles on the working plane, and the distribution is so arranged that there will not be a variation of 15% from this value in the darkest and lightest spots. R.L.M. reflectors are used with 100 or 150-watt lamps—for a large part bowl frosted. For inspection and other special work intensities as high as 30 foot-candles are used.

In order adequately to protect the workers, a complete and independent lighting system is used for emergency occasions. This system is supplied by a 200-kva. steam turbine in the power house which is kept running at all times when artificial light is required. This emergency lighting covers not only stairways, passageways and elevators, but the entire floor area, and gives sufficient light to enable one to get about readily.

For intercommunication the company uses the automatic telephone which is tied in with the city lines so that the same instruments are used for local or outside calls. The Autocall system is also used for locating foremen around the plant. Nothing has been spared to expedite production and safeguard the employe and thus to increase the general efficiency of the plant.

TABLE I

MOTOR DATA

	Number of Motors	%	Rated Hp. Motors	%
Alternating current motors	688	86.5	8884	91.8
Direct current motors	108	13.5	796	8.2
Total motors	796	100.0	9680	100.0
ALTERNATING CURRENT MOTORS				
5-hp. and smaller	388	56.4	794	8.9
7½ to 75-hp., inclusive	290	42.1	3980	44.9
Above 75-hp.	10	1.5	4110	46.2
Total	688	100.0	8884	100.0

The Business Branch of the Public Library

(Every alert business man has in the back of his mind a number of industrial questions whose answer he has not been able to find. In this respect the business branch of the public library can serve him to advantage. Below is an account of how this branch of the Indianapolis public library entertained the city Advertisers' Club at a profitable question-box hour which demonstrated the value of an active business library to the business life of any city.—The Editor.)

The Indianapolis business man with a noon time half-hour to spare who chanced to stroll into the down town business branch of his public library on March 5th last, anticipating a quiet perusal of his favorite journal or trade paper, remained to listen, but not to read. For he found the room crowded to overflowing with the members of the very up-and-doing Advertisers' Club of Indianapolis, who, instead of holding their regular weekly meeting, had assembled at the business branch to witness a practical demonstration of what the library can do for business men.

The Question Box

Usually a fairly peaceable body, on this occasion the club was armed to the teeth. They fairly bristled with questions designed to test the library. Some of these queries were, no doubt, inspired by the opportunity; but, for the most part, they were questions for which the answers had been long sought and not found.

These questions, written down on any old slip of paper handy, and collected by the city librarian who presided over the meeting, were distributed by him among the library assistants. To these attendants, on trial as it were, it might well have seemed that the most appropriate opening to such a meeting would be a prayer, but with outward calm, at least, they proceeded to search out the answers while the librarian held the audience by telling them in an informal way something about the business library idea, its history and development, describing various successful business libraries and giving some very illuminating examples of how books, magazines, pamphlets, clippings, statistics and maps have helped the business world in solving its problems and expediting its work. He further emphasized the value of an active and well-developed business library to the business life of a city, explaining how sudden exigencies of business life are met by a hurried telephone call from the place of business, followed by a prompt answer giving the desired information. He asserted that no inquiry was regarded as insignificant.

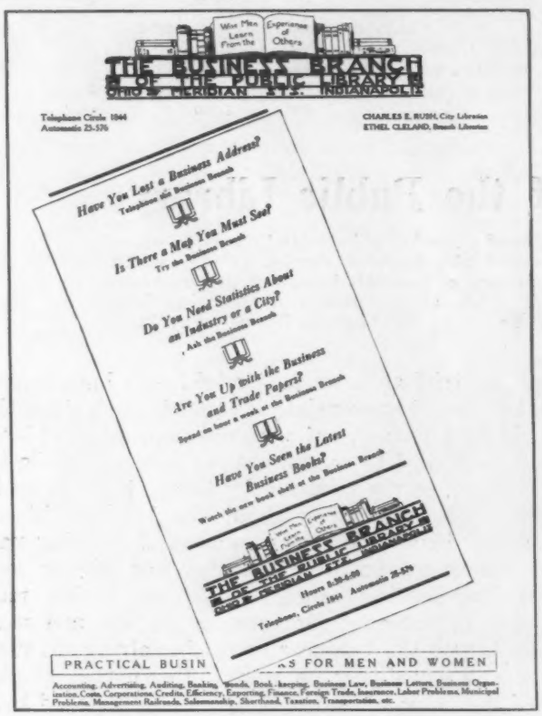
Contents of Library

To give the assistants who were still busily ferreting out answers to the impromptu questions a little more time, the branch librarian, by pointing out the cases holding the various classes of business

books on salesmanship, banking, advertising, factory management, accounting, insurance, railroads, etc; the long reading table crowded with all sorts of trade papers, business magazines, financial journals and

A room where light, air, and a table overflowing with trade papers, financial journals and business magazines offer occupation for five minutes, an hour, or a whole afternoon.

general periodicals; the files of pamphlets, maps, clippings and similar material; the special collections of reference books, trade directories, city directories, telephone books, state reports, federal documents,


THE BUSINESS BRANCH
OF THE PUBLIC LIBRARY
OHIO at MERIDIAN STS. INDIANAPOLIS
Telephone Circle 1944
Automatic 25-576
CHARLES E. RUSH, City Librarian
ETHEL CLELAND, Branch Librarian
Have You Lost a Business Address?
Telephone the Business Branch
Is There a Map You Must See?
Try the Business Branch
Do You Need Statistics About an Industry or a City?
Ask the Business Branch
Are You Up with the Business and Trade Papers?
Spend an hour a week at the Business Branch
Have You Seen the Latest Business Books?
Watch the new book shelf at the Business Branch
PRACTICAL BUSIN
S FOR MEN AND WOMEN
Accounting, Advertising, Auditing, Banking, Bonds, Book-keeping, Business Law, Business Letters, Business Organization, Costs, Corporations, Credits, Efficiency, Exporting, Finance, Foreign Trade, Insurance, Labor Problems, Municipal Problems, Management Railroads, Salesmanship, Shorthand, Taxation, Transportation, etc.

The special stationery and the stimulating folder shown above have been helpful in bringing the business library of Indianapolis to the attention of men in all lines of business.

house organs, chamber of commerce publications, etc., gave a rapid survey of what the business branch contained and showed how easy it was for anyone to come in and help himself to what he wanted.

When the last slip had been returned the city librarian read out each question and the attendant to whom it had been assigned gave the answer, telling the source of her information, displaying perhaps the particular book, or magazine, or pamphlet, or map she had consulted and, in some cases, tracing the various steps in the solution. If anyone thinks it was altogether an easy job, let him try to answer some of these representative samples from among the questions submitted:

Is "The Ford Owner" a house organ or a magazine?

What and where is the Ranger oil field?

Where were mouth organs manufactured before the war?

What city in the United States has a street called Mud Puddle Lane?

Is there a picture-wire manufacturer in Indiana? What is his capital?

Who makes envelopes in Chicago?

Give me a list of foreign consuls in cities near Indianapolis?

Which is greater, the amount of exports to Honduras from the U. S. A., or the amount of exports from Honduras to the U. S. A.?

How many men at home does it take to keep one man at the front?

Wanted—a list of mayors of all Indiana cities.

Who is president of the Cleveland Traffic Club?

How are blue prints made?

Financial information about the earnings of chain-stores?

List of all papers, magazines, etc., published in Indianapolis?

Something about the shale oil reservoirs of Colorado?

Where can I find out about training courses for employment managers?

Is Kansas City growing industrially faster than Indianapolis? If so, why?

In closing, just to give the Advertisers a chance to show what they could do, the librarian propounded a question to them which the library had recently

A representative gathering of the most popular class of books in the Indianapolis business branch. Of the samples of the questions submitted by the Indianapolis Ad Club, over a third were answered from these very volumes.

received from a manufacturing jeweler, who, having an order for some pins with instructions to use in the design the "Australian Umph," was eager to know what an "Australian Umph" is. But unfortunately, the hour struck and the meeting was adjourned before any members of the club had time to tell what an "Australian Umph" is—of course, a lot of them knew!

Writing Advertising Copy

BY JAMES LIGHTBODY

(That strong individuality, the ability to use new ideas, and the talent for putting oneself in the other person's place are all necessary qualifications of the successful advertiser is convincingly set forth by the author of this article, who is publicity manager for the British Columbia Electric Railway Company, Limited.—The Editor.)

Volumes having been written on the subject of advertisements, one might well hesitate before attempting to make a few suggestions. There is no subject in which individuality counts more than in advertising, consequently rules are few and far between and when available may be so general as to be of little use.

The first idea any electrical dealer should get out of his head is that writing advertisements is something which needs some special course and probably some inherent qualifications. On the other hand, some are apt to think of writing advertisements as something that the office boy can do. Neither of these views, needless to say, is correct. Advertising men are not picked from any particular line of business. They drift into the game as a rule because they have selling ideas. The wording of advertisements, important as it is, is considered by most to be secondary to the idea.

How this applies to the electrical dealer is this: The idea to put in your advertisement is, in nine cases out of ten, identical with the idea you would use when you want to sell an article orally. There is nothing new in this statement. Everyone knows that you should not in selling either by advertisement or over the counter say how glad you are to sell the appliance but how glad the customer should be to buy it. That is, your advertising, along with your selling, should be objective, not subjective. You should word your advertisement from the point of view of the person to whom you are appealing.

Thus, if you are appealing to women, you will talk about the convenience of electric appliances; if you are talking to men you will mention how their business will improve as a result of better store lighting. You won't talk about the excellence of the finish of the appliance or the effect of the store lighting upon your profits.

Since the idea's the thing in advertising, it is seldom advisable to advertise more than one appliance in the same space, unless you are advertising abstractly the idea of convenience. Another exception is Christmas advertising and the reason for this is that you are not appealing to a person who is **not** looking for something but you are appealing to a person who is looking for something. That is why department stores can cram their pages full of different items—their ads are practically news.

Having found your idea, the next essential in a good advertisement is a picture. The picture attracts attention—the first in the advertising sequence of Attention, Interest, Desire and Action. It also is easier to grasp than type and helps with Interest and Desire. The illustration should be human, like your copy. If possible it should have some human figure in it. The bare illustration of the appliance seldom pulls well, especially in putting over an idea like the convenience of electric appliances. If you are selling a coal range as a hardware merchant, you might get along with a cold, matter of fact illustration of such a range, but you can't get across with the convenience of electric cooking that way. You might sell tungsten lamps with a picture of such lamps, but it is much better to sell the idea of more light and its consequent pleasure and convenience.

When you start to write the advertisement, put yourself once more in the place of the person you want to reach. What phrase or sentence would catch the eye and keep the interest of the housewife, for instance? If you are a fisherman you know how the word "fishing" will catch your eye when you glance down a newspaper. So with everyone else. The housewife may be interested in "dishes," "cakes," "washing," "cleaning." If you expect to get her attention you have to push forward a word or two in which she is interested. Of course, the word here as everywhere else is only the symbol of the idea. It is the idea of dish-washing, cooking, washing clothes, cleaning carpets you want to put over, so your illustration should be aimed at the same object and it can generally get home much quicker than mere words can do.

It is not enough, however, merely to get the attention of a person. You should as much as possible link up the electrical idea with the catch phrase. That is, if you talk about washing clothes, incorporate "electrical washing machine" in the big type. Possibly this can be done in a second heavy type line elsewhere in the advertisement, but it is a good plan always to have the word "electric" or "electrical" somewhere in big type in your advertisement. The word itself is an attraction for most people.

People read advertisements much as they read newspaper headlines. They glance over the greatest part of the paper and read through only a few articles. There may be a few who will read your advertisement, but there will be many times that number who will merely read the headline of it. So you must get as much of your message home by these headlines as possible. Perhaps the repeated reading of such headlines will unconsciously arouse a desire in the mind of a person not previously interested.

It is a good plan suddenly to catch yourself reading through a magazine or newspaper and see how your attention is attracted to an advertisement. In most cases you are reading an article or story when your eyes wander to the adjacent advertisement and your attention is compelled to something you would not have thought about otherwise. Of course, a great many people go through newspapers

and magazines solely for the advertisements, but they are in the minority. But there again, you are competing for attention against all other advertisements. You may safely leave these people out of your account and frame your advertisement to attract the attention of the person who is not looking for it.

The type to use often bewilders the uninitiated. Most newspapers have type books which will explain the point system. Your headings will be set in 24-point, 30, 36, or 48-point and the body of your advertisement will be set in 8, 10, 12, or 14-point as the case may be. While you may vary the size of the type in your advertisement, reducing it possibly towards the end, it is a bad practice to use a great many different styles in the same ad with the idea that this aids its forcefulness. You may end up with some italic type, but changes in the "font" of type are seldom good.

There is one rule from which there is no exception; never put your headings or any of your paragraphs all in capital letters. "Lower case" letters such as this is set in are much easier to read. The eye tires of capital letters and refuses to read them.

It is also a mistake to suppose that heavy type or "black face" always means emphasis. It is much better to emphasize one point in your advertisement and throw it into relief by setting the rest in light face. But no rule can be formulated because different newspapers have different styles. Some are on the whole, black; others are light in appearance. The only suggestion is that an advertisement should be different from the rest.

One of the ways to be different is to use plenty of white space. Lots of advertisers put half the space they occupy into white space to display to better advantage the type and illustrations they use. This must remain a matter of judgment. In a newspaper which is filled with dense masses of reading matter and solid advertising, white space properly arranged will certainly pay well. On the other hand, in a newspaper where the news matter is fairly light in color and where the proportion of reading matter to advertising is high, less white space will be necessary.

Having decided upon what you will say in your advertisement, you should, as an aid to the printer, make a "lay-out." The accompanying illustration shows a typical lay-out as sent up to a newspaper. First, indicate your illustration, then by hand, write in your display type and the width. Width is reckoned in "ems"—a printers' measurement. You can buy an M-rule at any office supply store. Corresponding to these spaces, you should attach your "copy," lettered to show the space it is to fill.

So far, I have mentioned two elements which must be in every advertisement: the catch phrase and the electrical idea. The third is the name of your store or company. Of course, I am assuming that it is unnecessary to mention the part of the advertisement which gets the name on the dotted line; in other words, the invitation to call or telephone, the price, the easy payment terms and so forth.

There are some advertisers who have so consistently linked their names with their products that in some cities if you mention shoes, you instinctively think of "Brown," or if you mention candy you immediately visualize "Jones."

Your name should be fairly prominent. It is hardly necessary to emphasize this point, but some stores do not pick out proper type for their signature. It may be too small or hard to read. It may be similar to some other store of a different line. Whatever signature you adopt, you should stick to it continually, never using any other until it is indelibly stamped on the vision of people.

Your advertising should reflect the character of business you appeal to. High class trade will not be attracted to bargain store advertising. Yet advertising that is too conservative in tone and appearance will go over the heads of a great many reputable people who might come to your store and pay your prices.

Let me say in conclusion that advertising is one of the most important functions of the electrical dealer. Too often he relegates it to some subordinate while he himself assumes that window display, general store appearance and such functions demand his personal attention. It is poor business, too, to pay a high price for space in newspapers and then put anything but the best into it. It would be much better to buy less space and put the difference into buying advertising ability. With most electrical dealers it is not necessary to go outside their own walls to find the necessary talent. With the assistance given by manufacturers, the associations and some national advertising services, the dealer can get the help of some of the best advertising brains in the country for a nominal amount. All that is required is a little common sense and appreciation of local conditions to adapt such advertising to the dealer's needs.

DISPLAY WINDOW IN PORTLAND STORE

An artistic display of electrical appliances in a show window of the Stubbs Electric Company, Portland, Oregon. The absence of overcrowding and the arrangement of articles so that one does not detract from the value of another is noticeable.

Electricity in Mud Houses of the Southwest

BY HARLEY S. BRADLEY

(A new electrical home is shortly to be opened in Los Angeles. A distinctive feature of this structure is that it is built in the old Spanish style with adobe blocks. The architect here describes the details, and the advantages of this type of construction for California.—The Editor.)

There is no reason why sound, practical, livable homes cannot be built from adobe mud blocks any more than there is reason for not constructing them of brick, concrete, or any other good building material. In California, Arizona and Old Mexico, we find numerous structures which are evidence of their durability as a permanent and substantial building material, many of them having withstood the elements for upwards of one hundred and fifty years, without showing any noticeable signs of depreciation. Even the old Babylonian walls were built of sun baked mud blocks, and we are told that some of these old blocks are still intact, and clearly indicate the trade marks of those ancient builders.

Adobe built homes, if properly water-proofed, and finished with stucco which prevents them from absorbing moisture, are practically indestructible so far as natural disintegration is concerned. They will stand more than the average amount of wear, and in case of damage from any cause the walls may very easily be repaired with stucco. They should be reinforced with concrete lintels and plates, however, to distribute the floor and roof loads uniformly over the entire area of the wall surface. The first floor loads should be carried direct to the foundations, independent of the walls. Pine lumber should never be permitted to rest against the adobe walls, unless it has been first soaked with creosote, dead oil, or other similar material to prevent dry rot. The bearing plates should be of redwood, cypress or other water resisting wood, and should be securely bolted to the concrete plates.

Architect's drawing of the new two-story adobe electrical home shortly to be opened in Los Angeles

At the present time we are constructing "The Adobe Electrical Home," a two-story structure in the New Windsor Square district of Los Angeles. Unlike the old Spanish adobe houses in Southern California, this home incorporates in its construction all the most modern electrical features of present-day building methods, including 117 outlets, 37 of which are convenience outlets of the latest plug-in type for the efficient use of all household electrical appliances and labor saving devices, underground electrical service and complete telephone wiring.

This home will be completely furnished and decorated, "ready to live in," by Barker Bros. of Los Angeles. In its furnishings will be seen the most modern period furniture, oriental rugs, richly designed draperies, electrically operated piano and phonograph. In addition to the furnishings, this home will be equipped by the electrical industry with about fifty of the very latest and most practical household appliances, which can be seen in actual operation.

Surrounding the home will be a very elaborate Spanish garden, which has been designed and planted by the Beverly Hills Nurseries.

Special Advantages of Adobe Construction

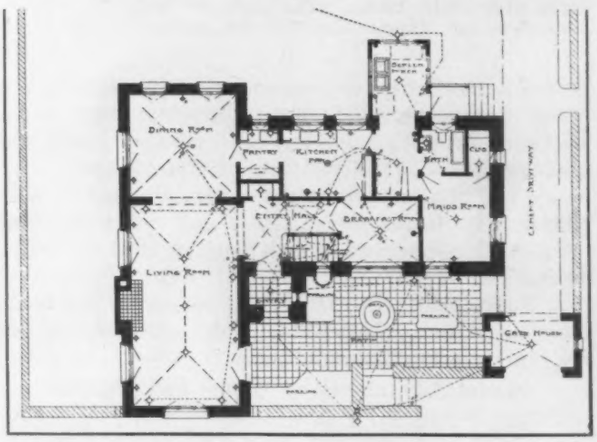
Every consideration has been given to practical convenient features and artistic simplicity of design, rather than to more elaborate and necessarily more expensive details. We also required a type of construction that would keep the house warm in winter, cool in summer, sound-proof and damp-proof, and one which would best withstand earthquake shocks without danger of fractured walls. We therefore decided upon adobe construction as the most practical and indigenous material suitable to the climate and conditions of California.

Adobe blocks are more resilient than any other building material that I know of, and therefore will stand severe shocks without cracking or impairing the strength of the walls. There is but little difference in the compressive strength of a well seasoned adobe block and that of common burnt brick, and when these blocks are dried they become an almost perfect insulation. Adobe construction also lends itself admirably to the Spanish type of design so well suited to the atmosphere of California. Deep reveals, large plane surfaces and arched openings, may be constructed at slight expense.

Low Cost of Building

From the standpoint of economy, a good idea of cost may be had from the following comparison: With common standard brick, at $20.00 per M. and labor and mortar for laying same at $20.00 per M., the cost of brick in a straight run wall will total $40.00 per M., making approximately 48 cubic feet of finished wall, whereas adobe blocks 4 in. thick, 12 in. wide and 24 in. long, will cost $65.00 per M.

and labor and lime mortar for laying same at $40.00 per M. will total $105.00 per M., and lay up an area of approximately 800 cubic feet. From these calculations, which are based on practical estimating, and



First floor plan of the new electrical home, showing the wiring scheme and numerous convenience outlets.

figuring a bricklayer's wages at $1.50 per hour, we find the cost of finished brick wall at 83c. per cubic foot, and adobe walls at 13c. per cubic foot. This estimate, however, is based upon using excavated adobe from the lot on which the building is to be erected.

Formerly, the chief objection to adobe construction was the usual disintegration of the walls at

Laying the adobe blocks for the newest electrical home. This home, built like the old Spanish houses, of adobe brick, will have a complete electrical equipment.

the grade line, due to the constant absorption of moisture. This error, together with the matter of an insufficient plaster bond, have been overcome by water-proofing the concrete foundations with liquid coal tar and extending them well up above the grade line, and providing a dove-tailed key on the surface of the blocks as a bond for the plaster.

It is my candid opinion that when the merits of adobe construction become more generally understood, and when ordinances have been established to govern this method of construction in one-story buildings, permitting only the use of approved tested blocks, then adobe construction will become a uni-

The exterior of the latest electrical home to be opened in Los Angeles follows early California traditions in architecture, combining the comfortable charm of the adobe house of Spanish days with all modern conveniences.

versal type for California homes, which will mean more artistic and more practical homes at less cost.

This home will be opened for public inspection within a short time, and is expected to attract larger crowds than any of the electrical homes so far opened in California.

PUMPING PLANT FOR RICE LAND

BY J. W. COONS

(The necessity of irrigating 25,000 acres of rice land in the Sacramento River Valley has caused the construction of an especially large and complete pumping plant in Colusa county. A complete description of the plant is given here by the Yolo district manager of the Pacific Gas & Electric Co.—The Editor.)

The pumping plant of Reclamation District No. 108 which is located on the west side of the Sacramento river in Colusa county, at a point about six miles south of Grimes, is rather different from the ordinary in its construction and equipment. It was installed to supply water for irrigation of the land within the district and it will supply sufficient water to irrigate about 25,000 acres of rice land. The largest land owners in the district are the River Farms Company, Jesse Poundstone and J. W. Browning.

A photograph of the pumping plant of Reclamation District No. 108 which shows a centrifugal pump installed for temporary service.

Two or three years ago, Reclamation District No. 108 installed at Wilkins Slough a set of gates in the Sacramento river levees which were placed

at a point close to the level of the bottom of the river, with the idea of obtaining water for irrigation purposes, by gravity feed, during the greater part of the year. The demand for water for irrigation purposes has increased beyond all expectations and on that account practically all the water that is used in the late summer will have to be pumped. The fact that the gates had been installed for controlling the water by gravity feed made it necessary to install a plant which would utilize the gates and tunnel which had been placed in and through the levee to control the water of the gravity system.

The pumping plant building is quite deep and narrow. The building extends about twenty feet above the top of the levee and is about eighteen feet wide and forty feet long. It extends from the top of the levee down to the top of the tunnels which were installed to allow the water to run through by gravity. The depth is approximately forty feet below the top of the levee. The pumps and the motors which are direct-connected are set up on the lower floor which is directly above the tunnel. On the gallery which is between the lower and the upper floors is the switchboard equipment and the exciter sets. The upper floor, which is on a level with the top of the river levee, is used only for an entrance.

The pump equipment will consist of six wood screw pumps, each of which is directly connected to a synchronous motor by means of a shaft that extends through the pump house wall to the pumps which are located on the river side of the pumping plant. These were installed on concrete piling as shown in the lower part of the attached cut. The pumps are designed to throw 100 second-feet when operating under an eight-foot head. The pump runner is shaped like a ship propeller but with more blades. A cut of the runner is shown herewith. The pump itself is approximately the same diameter as the suction pipe and from external appearances it would be taken for a part of the pipe. A set of blades which are shaped very similar to those on the runner are in the pump at a point directly adjacent to the pump runner. These blades tend to prevent the water from setting up a whirlpool or whirling motion in the pipe and the water after passing through them is directed in straight line motion toward the discharge. The pumps are primed while they are running at full speed and that is one reason why synchronous motors can be conveniently used for operating them.

Runner of one of the wood screw pumps at the Wilkins Slough plant

Each of the pumps is operated by a synchronous motor, rated 175 hp. and running at 240 revolutions per minute. The motors are supplied with 440-volt, three-phase, a.c. current, sixty cycles. The exciting current is supplied by a small motor-generator set which delivers direct current at 125 volts. The principal reason for selecting synchronous motors was the difference in price. Induction motors to operate 240 revolutions per minute were considerably higher than synchronous motors for the same speed, and a saving was made by installing them.

The photograph of the plant which was taken on the river side shows a centrifugal pump which was installed for temporary service. It was delivering approximately 70 second-feet and was driven by a 300-hp. induction motor. The three wood screw pump units are to be seen to the left and delivering 100 second-feet each and were driven by 175-hp. motors. No accurate check was made of the load on each of the motors. The synchronous equipment was not fully loaded. The low head conditions are favorable for highly efficient results with wood screw pumps.

The water that is pumped by this plant is used for irrigating the various tracts of land in Reclamation District No. 108. Over 10,000 acres of land was planted during the season of 1920. If there had been normal rainfall during the previous winter, there would have been 16,000 acres of land planted to rice. Owing to the fact that there was a prospect of a shortage of water and power, the acreage was cut down considerably.

OUTLINE LIGHTING AS A BUSINESS BUILDER

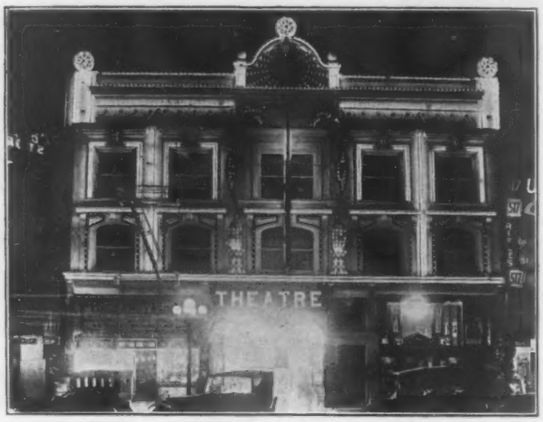
Trade seeks light as surely as moths are drawn to the flame, and one has only to take a walk in any business district to observe that concerns which are generous in the use of electricity have every evidence of prosperity.

On Main Street, Los Angeles, there are several theatres which have changed hands frequently as no one could make them pay, and the Burbank, a pioneer show-house in Southern California, has been the scene of many disastrous ventures. Recently, however, a new manager took hold of this theatre and gave his first attention to the matter of illumination, with the result that he now has one of the brightest spots in town and is doing a capacity business.

Burbank Theatre, Los Angeles

This building has a frontage of one hundred and fifty feet and is two stories in height. The architecture is characteristic of the eighties. Over three thousand lamps have been placed on the facade, completely outlining the principal architectural features. On the roof are six revolving wheels and over the

entrance, signs with changeable letters announce the weekly attractions. The outline lamps are all of the ten-watt size, being mounted in a continuous metal conduit. Two-thirds of the lamps are on a flasher and as many effects in colors are obtained the result is artistic and not garish.



Omar Theatre, Los Angeles

Soon afterwards the Omar theatre, directly across the street, ordered a similar installation. The Omar's history had been the same as the Burbank's, and the new lighting effects have had the same result. The principal features are two large flames over the entrance, a sunburst on the cornice, and three revolving wheels on the roof.

A third theatre on this street has since made an installation which is unique, as the outlining has been done with double-faced conduits, mounted some little distance from the face of the building. This is "The Follies," another show-place with an interesting history.

All three installations are from the shops of the Electrical Products Corporation of Los Angeles.

Pamphlets and Clippings in a Business Library

BY VIRGINIA FAIRFAX

(It is of no use to file a pamphlet under one subject if five people out of ten will look for it under another. The question of systematic filing and cross-indexing is here taken up in the seventh of a series of articles by the librarian for the Carnation Milk Products Company, Chicago.—The Editor.)

HOW INFORMATION IS CLASSIFIED AND INDEXED—PART 3

The Catalog or Index

In article five it was stated that in a business library the bulk of the material placed in the vertical files will have permanent value, and that under these circumstances it is wise to have some record of possession or receipt of the most important contents of such files. It is necessary to have at least what corresponds to a main entry or author card, and to a series card that will furnish a check on the contents of the files. For example, series cards made for the publications of the various state agricultural experiment stations will indicate the bulletins received and the subjects under which they are filed. There are occasions also when a business man asks for a pamphlet by the name of the author or firm or commission issuing the publication and does not remember its specific subject. In such instances the author entry is a valuable guide, as it also is when material is not found in a subject folder and the index shows either that it has been received and is loaned, or that the library has never possessed it.

Main entry or author cards are made only for material that is important and not for every leaflet and booklet that may possess only temporary interest or value. Library rules for cataloging are followed, omitting imprint that this class of material does not require. On the main entry or author card will be written, on the first line in the upper left hand corner, the Cutter number chosen from the subject of the pamphlet, the name of the author or source issuing the publication on the first line beginning at first vertical line at the left, with brief title on the second line beginning at second vertical line, and date of publication. (See Fig. 1.) No subject card is made. The Cutter number **W381** indicates that the pamphlet is filed in a folder marked **W381—Webb-Pomerene law.**

If a pamphlet received is to be analyzed, make main entry card as shown in Fig. 1 and indicate on

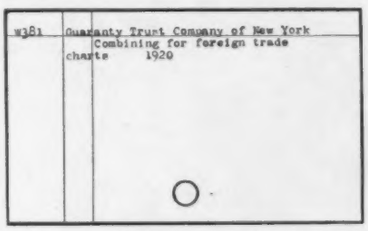


Fig. 1—Main entry or author card

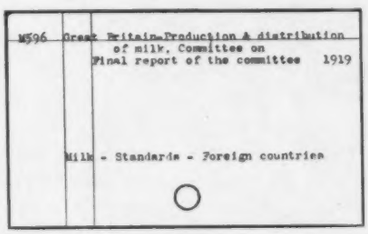

M596 Great Britain-Production & distribution
of milk, Committee on
Final report of the committee 1919
Milk - Standards - Foreign countries

Fig. 2—Main entry card, showing subject of analytical

lower part of face of card the subject or subjects of the analyticals. (See Fig. 2.) The pamphlet thus analyzed is filed in folder marked **M596—Milk industry & trade,** and the analytical card is written as shown in Fig. 3, the subject of the analytical, "Milk-Standards-Foreign countries" written in red and the remainder of the record in black, giving page on which that information is to be found. This card

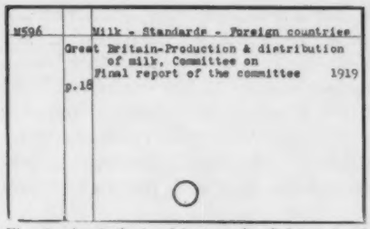

M596
Milk - Standards - Foreign countries
Great Britain-Production & distribution of milk, Committee on
Final report of the committee 1919
p.18

Fig. 3—Analytical subject card. Subject heading should be written or typed in red ink.

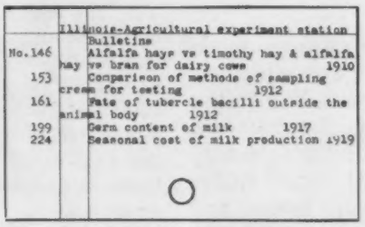

Illinois-Agricultural experiment station
Bulletins
No.146 Alfalfa hays vs timothy hay & alfalfa hay vs bran for dairy cows 1910
153 Comparison of methods of sampling cream for testing 1912
161 Fate of tubercle bacilli outside the animal body 1912
199 Germ content of milk 1917
224 Seasonal cost of milk production 1919

Fig. 4—Series card with tracing on back, showing omission of classification numbers.

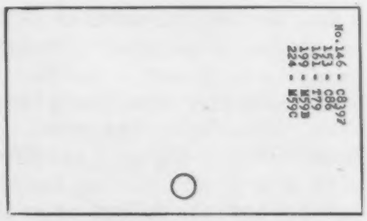


Fig. 5—Showing tracing on back of series card. Each bulletin number is followed by Cutter number that indicates where pamphlet is filed.

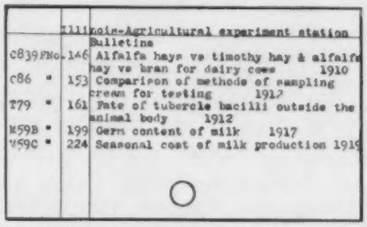

Illinois-Agricultural experiment station
Bulletins
C839 No. 146 Alfalfa hays vs timothy hay & alfalfa hay vs bran for dairy cows 1910
C86 " 153 Comparison of methods of sampling cream for testing 1912
I79 " 161 Fate of tubercle bacilli outside the animal body 1912
M59B " 199 Germ content of milk 1917
M59C " 224 Seasonal cost of milk production 1919

Fig. 6—Series card showing Cutter numbers for subjects of the pamphlets on face of card instead of on the back.

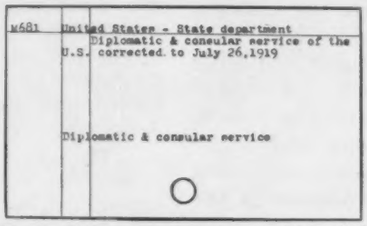

M681
United States - State department
Diplomatic & consular service of the U.S. corrected to July 26,1919
Diplomatic & consular service

Fig. 7—Main entry card for pamphlets filed in a general miscellaneous folder. Subject entry card will also be made, similar to illustration No. 10, and indicated on face of main

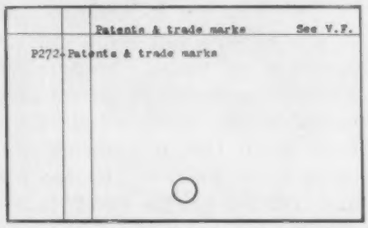


Fig. 8—A subject reference card. The items on this are written in red ink so that they can be readily distinguished from the other cards.

would indicate to the searcher that information on milk standards in various foreign countries can be found in this pamphlet filed in folder marked M596. This is easily located even should the searcher not know the meaning of Cutter number M596.

Series cards are also made according to library rules with the omission of the classification numbers. (See Fig. 4.) To locate any of the pamphlets thus listed consult the back of this card, which will show number of bulletin and its Cutter number for subject of pamphlet. (See Fig. 5.) Some librarians prefer to put all the notations, or tracings, on the face of the cards, in which case the card would be written as shown in Fig. 6. The only objection to this form of record is that the face of the card is apt to be too crowded with the notations.

If a folder for general miscellaneous material is used as described in Article 6, a subject card must be made for each piece placed in it, because there is no subject folder to indicate the position of this material in the file. For example, a library has a copy of the pamphlet giving the Diplomatic and Consular service of the United States and there will be but one copy of this pamphlet until superseded by a later issue. It is not necessary to put this one pamphlet in a folder under its subject. Drop it in the Miscellaneous folder and make a subject card, **Diplomatic & consular service,** which directs the inquirer to M681—which is the Cutter number for Miscellaneous. (See Fig. 7.)

If the files are equipped with miscellaneous folders for each guide, or division of the alphabet, as illustrated in the preceding article, then this pamphlet, "Diplomatic and consular service," would be filed in the Miscellaneous folder whose guide is marked nearest to the spelling of the first word of this subject, namely, "Diplomatic," guide marked "D" or "Di," and no subject card need be made.

"See" and "See also" references may be made either in the catalog or in the file itself, preferably in both. A "See" reference in the files should be made on a single sheet of stiff manila board, similar to the material of the folders and of same height referring from the name not used to the one used, as **Powdered milk See D-831-Driedmilk.** (See illustration in Article 6.) "See also" references may be made on the folder, and will obviate the need of consulting the card index in which, however, "See also" cards should be inserted at the end of the references. For example, on folder marked **In2L—Industrial laws & legislation** is added, **See also W892—Workmen's compensation,** and if there are any subject cards in the card index headed "Industrial laws & legislation" a card should follow reading "See also W892—Workmen's compensation."

If the files are extensive and there is also a large collection of books that have been cataloged or indexed, in other words, if the card index is a large one, covering references to books, periodicals, and the information files, time and effort will be saved by inserting in the card index, or catalog, subject reference cards to the main subjects in the information files. It will be recalled that main subject cards are not made for the material placed in the information files, the subject folders taking the place of such cards, but one card, a subject reference card for each main subject folder, may be placed in the index, which on many occasions will save time and prevent the assumption that there is no material in the library on the specific subject being looked up. For example, one card in the index marked **Patents & trade marks** See V.F. (vertical files) P272 indicates that a folder containing information on this subject will be found in the vertical files. (See illustration No. 8.)

Of course, this subject reference card is not necessary if the library's principal source of information is the material in the vertical files, because under these circumstances they will be consulted first or cannot be overlooked when searching for information.

Filing and Arrangement in Folders

When a collection of material has been made ready to be placed in the files, arrange it alphabetically according to subjects before proceeding to the files. First locate the correct guide, if guides are used, and then the subject folder. Lift the folder up a little to assure placing the material in the folder and not between folders or in the wrong folder, and always verify or check the marking on each pamphlet with the marking on the folder.

No attempt is made to alphabetize the material in the folders, but some order should be kept. For instance, all maps, photographs, pictures and large pamphlets should be placed at the back, and smaller pamphlets in front, standing upright side by side so that when the drawer is pulled out and folder opened the titles of the pamphlets are readily seen and read. Large pamphlets lie crosswise in the folders.

Elimination or Discard of Old Material

In some large public libraries very specific arrangements are made for the discarding of material at specified times. This is not necessary in a business library, since only a small proportion of the material is discarded. The elimination is made as the new material is filed; the old that is being superseded is discarded. It is advisable to take stock, at least once a year, and go through the files systematically, making room for new material by removing folders with subjects in which the firm no longer has any interest and pamphlets and clippings that were only of current value. The amount of discarding depends entirely on the interests and demands of the business house, also on the resources of the public library or other library facilities in the city in which the business library is located. At the same time, it is not wise to eliminate or discard material and statistics, though they may be old, that may be required some day by the business house because the information may not be available from other sources at the time it is most needed. It must be remembered, of course, to remove from the index all cards, main entry and analyticals, that refer to the material that is discarded.

REPORT OF ELECTRICAL HOMES EXHIBITED DURING 1920

The following report is made by the California Electrical Cooperative Campaign:

During 1920 there were four electrical homes exhibited in California. The first was at San Francisco in the St. Francis Wood tract. This home was open to the public from June 11th to 27th inclusive, 10 a.m. to 5 p.m. Approximately 20,000 visitors were shown through the home during that period. This electrical home was exhibited under the auspices of the San Francisco Electrical Development League, who assisted the Campaign in raising a fund for advertising from the electrical industry and cooperating with the Macon-McDuffie Company, owners and builders, with their regular advertising. The total expense of advertising this home was approximately $5,000, of which the electrical industry contributed $1,400.

The next electrical home was exhibited in Sacramento in the South Curtis Oaks tract. J. C. Carly, owner and builder. Open to the public July 31st to August 15th, inclusive, 1 to 10 p.m. Approximately 10,000 visitors. Total advertising expense, $1,100, of which the electrical industry contributed $550. This electrical home was exhibited under the auspices of the Sacramento Electrical Contractors and Dealers' Association, supervised by the Campaign representatives.

The next electrical home was exhibited in Oakland in the Lakeshore Highlands tract. Walter H. Leimert Company, owners and builders. Open to the public August 26th to September 12th, inclusive, from 10 a.m. to 10 p.m. Approximately 30,000 visitors. Total advertising expense, $3,300, of which the electrical industry contributed $1,100. This home was exhibited under the auspices of the East Bay Electrical Trades Association, supervised by the Campaign representatives.

The next electrical home was exhibited in Los Angeles at 900 North Kenmore Ave., Edwards and Wildey, owners and builders. Open for public inspection November 12th to 28th, inclusive, from 2 to 10 p.m. Approximately 19,000 visitors. Total advertising expense, $1,550, of which the electrical industry contributed $1,150. This home was exhibited under the direct supervision of Campaign representatives.

These electrical homes were completely furnished "ready to live in," including electrically operated piano and phonograph, without any expense to the electrical industry. The furniture and music companies installed the exhibits in cooperation with the electrical industry and the builders, from a self-interest viewpoint. These exhibitors also cooperated with the electrical industry and devoted considerable of their advertising space to the electrical home during its exhibition. The electrical appliances were drawn by lot and loaned by the electrical supply jobbers, and the demonstrators in these homes were also drawn from the electrical industry without expense to the Campaign. The electrical dealers and power companies also devoted considerable advertising space to electrical homes during their exhibition. Many full cooperative electrical pages in the leading newspapers were thus run without expense to the Campaign. Additional electrical homes are being planned for 1921 in the principal cities throughout the state. The next one of these to be exhibited will be in Los Angeles, about February 1, 1921.

OUTLETS IN ELECTRICAL HOMES

Class of Outlets	S. F.	Sacto.	Oakland	L. A.
Ceiling Outlets	20	11	13	9
Bracket Outlets	19	18	24	19
Wall Receptacles (Convenience Outlets)	34	26	35	25
Floor " " "	3	1	3	3
1 pole switches	21	17	18	10
3 pole switches	6	6	8	12
4 pole switches	....	....	....	....
Telephone outlets	3	2	2	1
Electric range outlet	1	1	1	1
Electric range switch outlet	1	1	1	1
Water heater outlet	1	1	1	1
Water heater switch outlet	1			
Total outlets	110	84	106	83

JOURNAL OF ELECTRICITY INDEX

The index to Volume XLV of the Journal of Electricity will be complete at the end of January and will be mailed to subscribers upon request.

Problem Course in Electricity

BY H. H. BLISS

(How does the distance of your dairy from your power plant affect the efficiency of the motor which drives the churn? The most economical way of wiring for a farm lighting plant is brought out in the following article, the thirteenth of a series. The author is on the staff of the Riverside Junior College, Riverside, California.—The Editor.)

WIRING FOR A FARM LIGHTING PLANT

The 30-Volt System.—In isolated communities where central station energy is not available, the 30-32-volt "farm lighting" units are becoming increasingly popular. Such a plant generally includes a small gasoline engine, a direct current generator and a storage battery. The generator is run only at intervals for charging, as the current for lamps, motors and other appliances is regularly taken from the battery.

This chapter deals with the application to a 30-volt system of the principles developed in previous chapters on wire calculations. It includes several special devices which will enable one to carry out the calculations for wiring a 30-volt load more easily and expeditiously than by the more general methods of the previous work.

Lamp and Motor Loads.—Current from a 30-volt plant is generally used for lamps and small motors. The approximate power consumption of these is indicated in Table No. 1 which follows:

Weight and Safe Load.—In Table No. 2 below will be found listed "Safe Watts" (in a 30-volt system) for both "rubber covered" and "weatherproof" copper wire of the sizes generally used. The former is the legal standard for interior wiring, while weatherproof wire is used for work out of doors. The safe loads were obtained simply by multiplying the "allowable amperes" of the Underwriters' rules by thirty.

The body of the table gives the weights (in pounds) of the two kinds of wire for different transmission distances. (The length of wire in each case is exactly twice the transmission distance, since two wires are used.) The grades of insulation represented in the table (single braid for the rubber covered and triple braid for the weatherproof) are often used in practice.

TABLE NO. 1

30-Volt Lamps and Motors

Vacuum Lamps		Gas Filled Lamps	
Watts per Lamp	Candle Power	Watts per Lamp	Candle Power
5	3.5	50	55.5
10	7.3	75	88.4
20	15.5	100	125.0
40	32.2		
Motor Horse Power	**Approximate Watts**	**Motor Horse Power**	**Approximate Watts**
1	930	1/4	250
3/4	710	1/6	170
1/2	480	1/8	130
1/3	330	1/12	100

To find the pounds of No. 6 rubber covered wire required when the load is 70 ft. from the 30-volt plant, run along the line for wire size No. 6 to the column headed "70 ft.", and find there the answer, 18.2 lbs. Should the distance be 120 ft. instead of 70, simply add the figures for 100 ft. and 20 ft., finding 31.2 lbs. For distances intermediate between those in the table, say 43 ft. transmission with No. 0 weatherproof wire, "interpolate" between the tabular figures thus: Add to 32.5 (lbs. for 40 ft.) 3/10 of the weight for 10 ft.; 32.5 + 2.4 = 34.9 lbs.

TABLE NO. 2

Weights and Safe Loads for Insulated Wires

(A) Rubber covered wire, single braid.

Wire Size B &S	Safe Watts at 30-v.	(Transmission distance upper figure, length of wire lower) 10 ft. (20)	20 ft. (40)	30 ft. (60)	40 ft. (80)	50 ft. (100)	60 ft. (120)	70 ft. (140)	80 ft. (160)	90 ft. (180)	100 ft. (200)
0	3750	8.8	17.6	26.4	35.1	43.9	52.7	61.5	70.2	79.0	87.8
1	3000	7.3	14.5	21.8	29.0	36.3	43.5	50.8	58.0	65.3	72.6
2	2700	5.5	11.0	16.6	22.1	27.6	33.2	38.6	44.2	49.7	55.2
3	2400	4.6	9.1	13.7	18.2	22.8	27.4	31.9	36.4	41.0	45.6
4	2100	3.8	7.6	11.4	16.2	19.0	22.8	26.6	30.4	34.2	38.0
5	1650	3.1	6.2	9.2	12.3	15.4	18.5	21.6	24.6	27.7	30.8
6	1500	2.6	5.2	7.8	10.4	13.0	15.6	18.2	20.8	23.4	26.0
8	1050	1.6	3.3	4.9	6.6	8.2	9.9	11.5	13.1	14.8	16.4
10	750	1.2	2.3	3.5	4.7	5.8	7.0	8.1	9.3	10.5	11.6
12	600	.9	1.7	2.6	3.5	4.3	5.2	6.0	6.9	7.8	8.6
14	450	.7	1.3	2.0	2.6	3.3	4.0	4.6	5.3	5.9	6.6

(B) Weatherproof wire, triple braid.

Wire Size B &S	Safe Watts at 30-v.	(Transmission distance upper figure, length of wire lower) 10 ft. (20)	20 ft. (40)	30 ft. (60)	40 ft. (80)	50 ft. (100)	60 ft. (120)	70 ft. (140)	80 ft. (160)	90 ft. (180)	100 ft. (200)
0	6000	8.1	16.3	24.4	32.5	40.7	48.8	57.0	65.0	73.2	81.4
1	4500	6.3	12.6	19.0	25.3	31.6	38.0	44.2	50.6	57.0	63.2
2	3750	5.2	10.4	15.6	20.8	26.0	31.2	36.4	41.6	46.8	52.0
3	3000	4.0	8.0	12.0	16.0	20.0	24.0	28.0	32.0	36.0	40.0
4	2700	3.3	6.6	9.8	13.1	16.4	19.7	23.0	26.2	29.5	32.8
5	2400	2.7	5.4	8.0	10.7	13.4	16.1	18.8	21.4	24.1	26.8
6	2100	2.2	4.5	6.7	9.0	11.2	13.4	15.7	17.9	20.2	22.4
8	1500	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
10	900	1.1	2.1	3.2	4.2	5.3	6.4	7.4	8.5	9.5	10.6
12	750	.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0
14	600	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

Watts and Distance.—Were it not for complications due to voltage drop, the selection of wires for any load would be performed simply by taking the smallest sizes permissible according to table No. 2. This would, however, result in voltage drops too great for satisfactory service, except in the case of very short transmission distances.

Assume, for example, that power to the extent of 600 watts is to be supplied to a load 120 ft. away from the battery, the wire being run indoors and hence required to be rubber insulated. Table No. 2 shows that wire No. 12 is "safe" for this current, and yet the voltage drop with this size would be prohibitive. It may be figured by the methods of the previous lessons thus: $600 \div 30 = 20$ amperes; resistance $= 240 \times 1.586/1000 = .381$ ohm; drop $= 20 \times .381 = 7.62$ volts. Had the distance been less, the drop would have been correspondingly lower.

A voltage drop of 7.6 volts is much too great to be permitted on a 30-volt system. For lights the drop can not exceed 2 volts, and it should be less if possible. When the load is a motor, with no lamps in the circuit, the drop may be as much as 3 volts; if greater, the motor will run slowly and refuse to deliver full power.

Selecting the Wire.—Table No. 3 is used in finding quickly the size of wire best suited for any given conditions. The first step is to multiply together the watts in the circuit by the corresponding transmission distance, obtaining a number which may be known as the "circuit constant." In the case assumed above this constant is $600 \times 120 = 72{,}000$. If the load is a motor, we enter Table No. 3 at the column headed "3 volts drop" and run down until we reach 72,000. Evidently wire No. 8 is indicated, and this is the size selected, **after checking it for safety in Table No. 2.** Had the load consisted of lamps, the smallest permissible wire would have been found by seeking the "constant" 72,000 in the column headed "2.0." Wire No. 6 is indicated, for 76,000 (in line with No. 6) is the lowest number greater than 72,000 in that column. **When the exact constant does not appear in the column, take the nearest larger number as the constant.**

Table No. 3 can also be used to tell the voltage drop for any wire. In the example above, if No. 4 wire were used the drop would be about 1.2 volts, for the number in the row corresponding to No. 4 which is nearest to the circuit constant 72,000 is 72,600, and this is found in the column headed "1.2." In the examples below will be shown the use of this table in determining other factors of importance in laying out a distribution system for a 30-volt plant.

Examples.—What is the greatest distance a No. 8 wire will carry a load of 180 watts (allowing a 2-volt drop)? In Table No. 3 read toward the right from wire No. 8 to the column headed "2.0," finding circuit constant = 47,800, which = watts $\times$ distance. Distance $= 47{,}800/180 =$ **265 ft.**

How many 32-volt 20-watt lamps can be used at the same time 150 ft. from the storage battery if No. 10 wire is used? Circuit constant from Table 3 is 30,000. Watts $= 30{,}000/150 = 200$. Answer, **10 lamps.**

Two separate loads are served from a 30-volt plant as shown in Fig. A. Find voltage drop to the farther load. The total load carried on the No. 3 wire is 650 watts; circuit constant for this wire $= 650 \times 150 = 97{,}500$. From Table 3 the drop is over 1.2 volts, or approximately 1.3 volts. Circuit constant for the No. 10 wire is $400 \times 80 = 32{,}000$. The drop here is between 2 and 2.5 volts, approximately 2.1 volts (as 32,000 is about 1/5 of the way between 30,000 and 37,600). Total drop = **3.4 volts.**

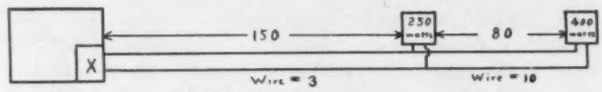


Fig. A.—Diagram of circuit serving two separate loads served from a 30-volt plant. Find voltage drop to the farther load. The total load carried on the No. 3 wire is 650 watts.

TABLE NO. 3

CIRCUIT CONSTANTS

WIRE SIZE	VOLT DROP .2	.4	.6	.8	1.0	1.2	1.4	1.6	2.0	2.5	3.0
0	30600	61200	91700	122000	153000	183000	214000	244000	306000	382000	458000
1	24300	48500	72800	97100	121000	146000	170000	194000	242000	303500	364000
2	19200	38400	57700	77000	96100	115000	135000	154000	192000	240000	288000
3	15300	30500	45800	61000	76300	91500	107000	122000	153000	191000	229000
4	12100	24200	36300	48400	60500	72600	84700	96800	121000	151000	181000
5	9600	19200	28800	38300	47900	57500	67100	76600	95800	120000	144000
6	7600	15200	22800	30400	38000	45600	53200	60800	76000	95000	114000
8	4800	9600	14400	19100	23900	28700	33500	38200	47800	59800	72000
10	3000	6000	9000	12000	15000	18000	21000	24000	30000	37600	45100
12	1900	3800	5700	7600	9500	11400	13200	15100	18900	23600	28400
14	1200	2400	3600	4800	6000	7100	8300	9500	11900	14900	17800

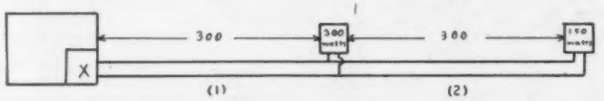


Fig. B.—Layout of farm buildings. Find best sizes of weatherproof wire to use, with 2 volts drop allowed between power plant and farther load.

Find the best sizes of weatherproof wire to use for the layout of farm buildings shown in Fig. B, with only 2 volts drop allowed between the power plant (at point X) and the farther load. We shall try several alternative schemes to be sure to find the best, which will be one calling for the least weight of wire while fulfilling the given conditions. We first find the circuit constants for each of the partial circuits, calling the wiring from the plant

TABLE NO. 4

Circuit	Constant	Transm. Dist.	1st Scheme No.	1st Scheme Drop	1st Scheme Wt.	2nd Scheme No.	2nd Scheme Drop	2nd Scheme Wt.	3rd Scheme No.	3rd Scheme Drop	3rd Scheme Wt.
(1)	135,000	300	0	.9	244	1	1.1	190	2	1.4	156
(2)	45,000	300	5	1.0	80	4	.8	98	3	.6	120
					324			288			276

to the 300 watts (1), and the rest of the wire (2). Circuit (1) carries 450 watts 300 ft.; its constant, then, is 135,000. The constant for (2) is 45,000. As a first attempt, assume circuit (1) to be of No. 0 wire. The drop in it then is .9 volt, from Table No. 3. This leaves a permissible drop of 1.1 volts in circuit (2). Table No. 3 shows that No. 5 wire is the smallest possible, as No. 6 gives a drop of 1.2. Then from table No. 2 we find the weights of the wires as 244 + 80 = 324 lbs. This figure is to be compared with the total weights for other assumed systems. The work is best done in tabular form as shown in Table No. 4 above.

The third scheme gives the lowest weight and should be adopted, after noting that the wires are safe, according to table No. 2. Evidently no other combination can be found which would give greater economy.

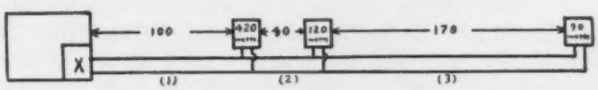


Fig. C.—What are the best sizes of rubber insulated wire to use in order to have only two volts drop between the plant and the farthest load?

Answers for Previous Problems

135. Resistance doubles for every third size, 13, 16, 19, 22, which makes it 16 ohms for No. 22. Multiplying by 10 we obtain **160 ohms per 1000 ft.** for No. 32. The weight of No. 22 is 1/16 of that of No. 10, or 2 lbs.; for No. 32 it is 2 ÷ 10 or **.2 lb. per 1000 ft.**

136. 1/10 in. = 100 mils; 100 × 100 = **10,000 C. M. for No. 10.** Since area and weight are proportional, the same rules hold. No. 4 has 4 × 10,000 = **40,000 C. M.**; No. 30 has 10,000/100 = 100 C. M.; No. 33 has 100/2 = 50 C. M.

137. Resistance of 1500 ft. must not exceed 10/40 = .25 ohm, or .167 for 1000 ft. Wire evidently must be larger than No. 10; No. 7 has .5, No. 4 has .25, No. 1 has .125 ohm per 1000 ft. The wire needed is between Nos. 1 and 4. No. 2 has .125 × 1.26 = .158 ohm; No. 3 has .125 × 1.59 = .199 ohm. Hence we select No. 2. Its weight per 1000 ft. is found from that of No. 4: 128 × 1.59 = 204 lbs.; 1500 ft. weight **305 lbs.**

138. Resistance is the same as for copper No. 20, or 10 ohms per 1000 ft. Weight is the same as for copper No. 23; 32/10 = 3.2 for No. 20; 3.2/2 = **1.6 lbs. per 1000 ft.** The C. M. area of No. 19 is 10,000/8 and of No. 18 is this × 1.26, or **1570.**

139. No. 28 in the B & S gage.

140. 19,050/254 = 75 strands; 4.075/75 = **.0544 ohm.**

141. 1,750,000/91 = 19,230 C. M. in each wire; diameter = sq. rt. of 19,230 = **139 mils or .139 inch.** Noting from the wire table that wire of 100 C. M. weighs .304 lb. per 1000 ft., this cable would weigh 17,500 times as much, or about **5,320 lbs. per 1000 ft.**

142. 11,500/.0867 = **133,000 lbs. per sq. in.**

143. 669 ohms.

144. Taking first B and C: 150 ohms in parallel with 309 gives 150 × 309/(150 + 309) = 101 ohms. Adding line resistance gives 461 ohms outside of station A. Then 150 × 461/(150 + 461) = 113 ohms. Current = 3/113 = **.0265 ampere.**

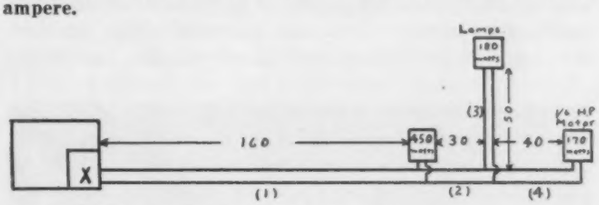


Fig. D.—Allowing two volts drop to lamp and three to motor, what size of weatherproof wire will be most economical?

145. 125/490 = .255 cu. ft.; .255/1000 = .000255 sq. ft. = **.0367 sq. in. = 16,700 C. M.** Diameter = sq. rt. of 46,700 = 216 mils = **.216 in.** Taking the tensile strength as in problem 142, the breaking pull would be .0367 × 133,000 = **4,880 lbs.**

146. Area = 220 × 220 = 48,400 C. M. Resistance of 1 ft. = .00153 ohm; of 1 C. M. foot the resistance = .00153 × 48,400 = **74 ohms.**

147. Circuit voltage = **113.2.** Ohms = **21.38.** Ohms per 1000 ft. = 1000 × 21.38/9.58 = 2230. The copper wire of same size has 2230/69 = 32.31 ohms per 1000 ft. Size is **No. 25.**

148. Ohms = 53/15 = 3.53 for 14 ft. Ohms per foot = .252. Hence we use **No. 16** wire. This current will heat it to **over 1200°**, and hence the resistance will be over 1.12 × 3.53, or about 3.95 ohms.

149. Current = 364/110 = 3.3 amperes, which indicates that wire No. 22 should be selected. The resistance needed = 110/3.3 = 33.3 ohms; No. 22 wire at 600° has 1.06 × 1.01 = 1.07 ohms per foot; 33.3/1.07 = 31.1 ft. of wire. The weight = 31.1/566 = .055 lb., costing .055 × 820 = **45 cents.**

30-Volt Distribution Problems

150. What size of rubber covered wire should be used for a lamp load of 450 watts 100 ft. from the plant, and what size for another lamp load of 180 watts 90 ft. from the plant in another direction?

151. Find the voltage drop if a load of 500 watts is carried 80 ft. on No. 3 wire.

152. Find the weight of wire in Problem 150.

153. What weight of rubber covered wire is necessary to operate a ½-hp. motor 130 ft. from the plant, allowing 3 volts drop?

154. Find wire sizes to use if a load of 600 watts is 60 ft. away and another load of 60 watts is 80 ft. farther in the same direction. Use weatherproof wire and limit drop to 2 volts.

155. Find best sizes of rubber insulated wire to use in Fig. C to have only 2 volts drop between the plant (at X) and the farthest load.

156. What sizes of weatherproof wire will be most economical for the case of Fig. D, allowing only 2 volts drop to the lamps and 3 to the motor?

TRANSPORTATION DIFFICULTIES

BY W. F. FORSBERG

(How to overcome difficulties of transportation is a common problem of hydraulic construction companies, but when the time element also enters in, an achievement such as that recorded in the following article is doubly interesting.—The Editor.)

Transportation difficulties are the rule rather than the exception, in hydroelectric development. This is due to the very nature of the materials to be handled, especially large and heavy pieces of machinery, such as generators and water wheels, and to the

One of the large units being conveyed through a narrow canyon by means of a ⅞-in. steel cable

fact that most plants are in out-of-the-way places in the mountains and a considerable distance from the railroad; but let it be said to the credit of the American hydroelectric construction engineers, that these difficulties are usually solved in a very efficient and speedy manner.

The Bureau of Light and Power of the city of Los Angeles is no exception to this rule, as shown in their construction of Power House No. 2 on the Los Angeles Aqueduct, which was completed this year in a race against time, due to the extremely dry years and the shortage of power and water.

Difficulties arose in the transportation of the two rotors of the 17,500-kw. vertical turbine gen-

Transporting one of the large units for the New Power House No. 2 on Los Angeles Aqueduct, over one of the fills on the journey.

erators. Each of these rotors weighed 75 tons and had to be transported over ten miles of road consisting mostly of creek bottom land, with a large number of fills and cuts.

The first unit was transported on specially constructed trucks, which were hauled by twelve auto trucks and two track-laying tractors. Twenty-two days were required to deliver the unit to the site of the power house. This was considered good time, owing to the fact that the roads kept giving out when most needed. It was estimated that each day saved in getting this plant in operation meant a saving of somewhere in the neighborhood of two thousand dollars.

Under the direct supervision of Mr. J. G. Wilson of the transportation department, the second unit was lagged with 6 -in.x 8-in. rough Oregon pine, as the illustrations show, and two cables, approximately three hundred feet in length, of ⅞-in. plow steel, were used for towing the rotor. While one cable was being unreeled and thereby rolling the rotor along, the second cable was being wound on, so there was no delay, and the rotor was moved approximately 150 feet to each pull. One 75-hp. track-laying tractor was used for the main haulage and one 60-hp. tractor was used for steering and helping, also acting as a brake on the down grade. This second unit was delivered to the power house in a total of eleven days, or at the rate of about one mile per day. The total time consumed was half that of the first unit and the saving in time and money showed that the effort was well justified.

These power houses are located in the picturesque San Francisquito Canyon and the illustrations show the rotor and the tractors used on one of the fills and in one of the narrow canyons.

POWER USED IN INDIA

It was found in 1917 that the electric power used in various industries and localities in India amounted roughly to 215,000 kw., of which 36 per cent was obtained from water power, the total units generated amounting to 550 millions. The following comparison with other parts of the British Empire shows how backward is the electrical development of India:—

	Watts installed per capita	Sq. miles per kw. installed
Canada	148	3.5
Australasia	62	11*
South Africa	57	1.4
British Isles	33	0.083
India	Under 1	7.6

*Largely uninhabited.

No complete census of the total power requirements of India has yet been undertaken, but suggestions for such a census have been made in a recent report.

A number of industries might grow up in India if cheap electric power were made available. Among these industries may be mentioned the electric smelting of indigenous iron ores and the electrical production of steel and its alloys; electric welding (now extensively employed); the manufacture of aluminum from alumina prepared from local bauxite deposits; the manufacture of calcium carbide and its derivatives; the fixation of atmospheric nitrogen; the electrolytic production of chlorine; and the preparation of phosphorus and abrasives. In all these industries cheap power and large scale production are essential to success.

SPARKS—Current Facts, Figures and Fancy

(Never has a more astounding rumor occurred in the scientific world than the one presented on this page along with an announcement of the world's largest seaplane, the latest applications of the wireless telephone and the substitution of the electric log for the one forest-made. A significant proof of the electrically propelled superdreadnaught's efficiency is also presented.—The Editor.)

Electrical dredging is responsible for making Yuba county, California, the biggest gold producer, according to a report of the U. S. Geological Survey.

* * *

Of course, it isn't a matter of personal concern, yet we are interested to note that the number of persons with incomes exceeding $1,000,000 per year decreased from 141 in 1917 to 67 in 1918.

* * *

Harmony will surely prevail in a new Santa Rosa (California) church, for every part of it, except the flooring, came from one tree, a giant redwood, which yielded 78,800 feet of timber and many shingles.

* * *

The largest seaplane in the world is being constructed in the Philadelphia navy yard. This double service ship is equipped with nine Liberty motors, it measures 175 feet across the wings and weighs sixty thousand pounds.

* * *

Speaking of fruit shipping, a total of 35,500 carloads of fruit have gone East during the past year, according to heads of shipping companies, who also state that this fruit has sold in Eastern markets for at least $80,000,000 or $90,000,000.

* * *

Since we cannot eat, can or ship all of the fruit raised in California, there is considerable work to be done by the dehydrator. Over 150 of these plants, many of which depend upon electric power, have been erected in California during the past year. These have the aggregate capacity of 13,500 tons per charge.

* * *

Every day, or every week at least, a new application is made of the wireless telephone. The police department of St. Louis has installed a sending outfit with a radius of 40 miles at the police headquarters and three automobiles have been equipped with receiving apparatus. Thus it is possible to change the orders of a squad while it is at work.

* * *

Electric fire-logs are becoming surprisingly popular in English homes; in fact, six hundred of these logs for fireplace heat have recently been ordered. These logs which are made in New Jersey are made of hard burned fire clay with the color fired in. The housing committee of the Borough of Aylesbury has decided that electrical heating apparatus shall be installed in the bedrooms of houses that are now being erected.

It is encouraging to note that nearly one-half of the nation's overseas commerce of the past fiscal year was carried in American ships. The overseas trade reached the unprecedented total of $11,875,424,000, and $5,071,906,000 of it was carried in American-owned vessels as against $368,359,000 carried in American bottoms the year before the war.

* * *

If hydroelectric development means industrial development, Mexico is showing signs of progress. Arrangements are being made for the development of 100,000 hp. in the Rio Verde Valley. This governmental permit of the state of San Luis Potosi is the first of its kind to be given out since the revolution ten years ago. Surveys for the $2,000,000 dam have already been made.

* * *

When the electric type of propelling machinery was installed on the superdreadnaught Tennessee, some prediction was made that serious damage would result from any short circuit which might occur. This prediction was entirely disproved when a short circuit occurred in one of the main generators on a recent trial trip. It was only necessary to shut down the damaged generator and start up the other one, continuing the ship's progress at three-fourths of her maximum speed with all four propellers.

* * *

Tetrazzini has sung to large audiences, but not until recently has she delighted any as enormous as the U. S. Navy, especially with a large portion of the latter in the middle of the Atlantic or Pacific ocean. Standing in her New York apartment she recently sang four songs into a telephone tuned to transmit her voice to the telephonic receiving sets of the U. S. Navy vessels, and the crews were assembled at the concert hour to hear the music which was projected through amplifiers.

* * *

Because it is so utterly amazing, the most conservative cannot but stop to consider a recent report that Gustave Lentner, an Italian inventor, has designed a piece of apparatus by which static electricity of the atmosphere can be transformed into regular dynamic currents. It is explained that the electricity in the soil and that of the atmosphere are reciprocally attracted by induction, while the radio active substances in the simple apparatus cause a mysterious reaction which changes the nature of the current. At least the Italian government feels that further research is of enough importance to warrant its special request to this effect.

PERSONALS

Edwin O. Edgerton, president of the California State Railroad Commission, has announced that, upon the expiration of his term of office, he will establish offices in San Francisco and Los Angeles for the purpose of practicing as a financial counselor and legal adviser. Mr. Edgerton, who for some time has been among the most prominent lawyers of the state, has served as a member of the Railroad Commission for nine years. Since the resignation of Max Thelen in 1918 he has been chairman of the Commission, and during this time has won the sincere regard of the people of California because of his straightforward and just administration of the complicated public utility affairs which have arisen under his regime. Readers of the Journal of Electricity will be pleased to know that a series of valuable articles on the subject of public utility regulation, in its effect upon the development of the industrial West, will appear in early issues of this magazine, which will unquestionably be followed with interest by a large group of readers throughout the nation.

O. L. Johnson, vice-president of the Illuminating Engineering Society and field representative of the National Electric Light Association Department of Lighting, is making a tour of the Pacific Coast where he will deliver a number of lectures on industrial illumination.

James H. McGraw, president of the McGraw-Hill Company, Inc., **J. Malcolm Muir,** vice-president of that company, and **H. H. Lewis,** advertising director of the Electrical World, Electrical Merchandising and Journal of Electricity, will be in San Francisco during the first week of February.

A. H. Griswold, formerly plant engineer for the Pacific Telephone & Telegraph Company with headquarters at San Francisco, is now assistant chief engineer of the International Western Electric Company, Inc., with headquarters in New York City. Mr. Griswold has recently returned from a trip to Europe in the interests of his company.

John R. Cravath, of the engineering firm of Fowle and Cravath, electrical, illuminating, and mechanical engineers, is to make his permanent home in California in the early part of January. Mr. Cravath is one of our best known authorities on illumination in industrial plants. He was for many years connected with Electrical World on its editorial staff. We welcome his engineering talent to California.

Richard G. Harris, who has recently been appointed Pacific Coast manager of the Standard Underground Cable Company, succeeds **John P. Bell.** Mr. Bell will hereafter devote his time to the growing demands of his export and import business. Mr. Harris has been connected with the company since 1909. For the last eight years he has been manager of the Montreal office of the Standard Underground Cable Company of Canada, Ltd.

Laurence W. Davis, special representative of the National Association of Electrical Contractors and Dealers, is making an extended trip through the western section of the United States in the interest of the National Association. Mr. Davis will speak in Salt Lake City on the evening of the 19th, in Butte on the 22nd, Spokane on the 25th, Seattle on the 28th and Vancouver on the 31st. Starting south Mr. Davis will speak in Tacoma on the third of February, Portland on the fourth, San Francisco on the seventh and ninth, Fresno on the tenth, Los Angeles on the eleventh and Phoenix on the fourteenth.

Arnold Pfau, hydraulic engineer for the Allis-Chalmers Company, has recently returned to the home office at Milwaukee after a fifteen months' sojourn in foreign countries engaged in his business activities. Mr. Pfau will be remembered as an engineer who spent much time on the Pacific Coast and has had much to do with pioneer work in the development of hydraulic turbines for hydroelectric development of the West.

M. I. Pupin, professor of electro-mechanics, Columbia University, and director of the Phoenix Research Laboratory of the same university, has been awarded the Edison Medal for the year 1920 by the Edison Medal Committee of the American Institute of Electrical Engineers. In the words of the committee, the medal was awarded "for work in mathematical physics and its application to the electrical transmission of intelligence." This medal, which is awarded annually for meritorious achievement in electrical science, electrical engineering, or the electrical arts, was founded by the Edison Medal Association, composed of associates and friends of Thomas A. Edison.

Max Thelen, formerly president of the California Railroad Commission, has returned to California from Washington, D. C. Mr. Thelen is establishing general law offices in San Francisco. During the war period Mr. Thelen resigned from the California Railroad Commission, where he had been doing excellent work not only as head of the regulatory body but also in directing certain research activity in connection with the conservation of our fuel oil supply. While in Washington Mr. Thelen entered war service as surveyor of contracts, chief of the purchase branch, and first assistant to Major-General George W. Goethals of the War Department. Immediately after the war he became director of the Division of Liquidation of Claims of the United States Railroad Administration. Mr. Thelen is recognized in the West as possessing a clear, analytical and forceful mind, and he has the best wishes of the electrical industry in the practice of the profession which he has now entered.

H. Foster Bain, consulting engineer and former editor of the Mining and Scientific Press of San Francisco, has accepted an appointment as Director of the Bureau of Mines to succeed Dr. Frederick G. Cottrell, who is retiring in order to carry on important research work. Dr. Cottrell, a native of California and well known instructor at the University of California, is the inventor of the Cottrell process which has made possible the electrical precipitation of fume and fine particles suspended in the gases of smelter, gas furnace and cement works flues. Those who appreciate the scientific service which Dr. Cottrell has already rendered the industrial world have faith in the valuable results of the personal research which he is planning. Mr. Bain, who is to be his able successor, served as assistant director of the Bureau of Mines during the war and since that time has spent some time in the Orient, where he has made extensive explorations in the interest of the Yunman Mining Corporation. Mr. Bain's close contact with problems of the West will make it possible for him to aid greatly in developing mining resources in which the West is so wonderfully rich.

Chester H. Rowell, who has received an appointment from Governor Stephens as a member of the California State Railroad Commission, has for several years been an unusually prominent figure in civic affairs of this state. He has been editor of the Fresno Republican since his coming to California in 1898 and is responsible for the remarkable influence which this paper now has throughout the West. Mr. Rowell has rendered able service as chairman of the Social Insurance Commission, member of the California Council of Defense, regent of the University of California, director of the California Development Board and vice-president of the National Municipal League. The position of railroad commissioner involves unusual responsibility and wisdom at this time when equal justice to the utilities and the public is vital. This appointment is one of great interest to the entire electrical industry.

O. S. Johnson, of the Benjamin Electric Manufacturing Company is touring the Pacific Coast, with the purpose of spreading the story of industrial illumination.

Paul Lebenbaum has recently been appointed assistant electrical engineer for the Southern Pacific Company, with headquarters in San Francisco, vice **F. E. Geibel,** resigned.

W. G. Stearns, for many years associated with the Standard Underground Cable Company on the Pacific Coast, has been appointed special sales agent, with offices at San Francisco.

Fred A. Williams has been elected chairman of the Public Service Commission of Oregon to succeed Fred G. Buchtel, who has served in that position for the last two years. **W. P. Ellis** was re-elected secretary.

L. E. Voyer, illuminating engineer for the General Electric Company, was a recent visitor in Los Angeles where he attended the committee meeting on motor vehicle headlights. This committee is making investigations for the California Highway Commission.

H. R. King, who has been power and light sales manager of the Western Electric Company, has resigned from that company to take up his new duties as general sales manager of the M. S. Wright Company, Worcester, Mass., manufacturers of the Pneuvac vacuum cleaner.

Thomas A. Addison, Pacific Coast manager for the General Electric Company, **E. O. Shreve,** manager of San Francisco district, **J. A. Cranston,** Portland manager, and **R. J. Cash,** Los Angeles manager, spent December 27th, 28th and 29th in Del Monte where they gathered for the annual managers' conference.

L. A. Somers, manager of the Coast Equipment Company, was re-elected president of the San Francisco Lions' Club at the recent annual election. He has announced that the national convention of the Lions' Clubs of the United States will be held in Oakland in July of this year. Over 1,000 delegates will be present.

William H. Crawford, head of the Department of Industries of the Portland Chamber of Commerce, will be in San Francisco during the early part of February. Mr. Crawford is in especially close touch with industrial developments of the Northwest, since practically all of the industrial associations in that part of the country are members of the Chamber of Commerce.

Norton Ware has announced his connection with the C. E. Grunsky Company, Engineers, in connection with the recent enlarging of their business to cover problems of business and technical analysis. These problems include the determination of proper depletion and depreciation factors for use in preparing income tax returns, and making adjustments with the Internal Revenue Bureau.

Norman S. Gallison, who became news editor with the Journal of Electricity on January first, has been assistant in the department of economics at the University of California since his graduation from that institution. Mr. Gallison has had considerable experience along journalistic lines, having been editor of the Daily Californian.

Otto E. Osthoff. vice-president of H. M. Byllesby & Company, Chicago, who recently made a tour of inspection of that company's properties in California, reports that, despite industrial recessions and readjustments, utilities in that section will not be affected because they are dealing in absolute necessities. This feeling, he states, is largely influenced by the fair and constructive attitude of the California Railroad Commission.

Emmet N. Britton, managing editor of the Journal of Electricity, left for a three weeks' tour of the Western states on January 1st. Mr. Britton's itinerary will include Portland, Seattle, Vancouver, Spokane, Butte, Salt Lake City, Riverside, San Diego and Los Angeles. He is engaged in an investigation of industrial developments and general business conditions of the territory covered, with a view to enlarging the service of the Journal of Electricity.

H. L. Doolittle, assistant construction engineer for the Southern California Edison Company, has just returned from an Eastern trip which he made as a delegate to the convention of the American Society of Mechanical Engineers. Mr. Doolittle is chairman of the Los Angeles section of this society. During his trip he visited factories of Cramp and Sons, General Electric Company, M. W. Kellogg and Allis-Chalmers, also power plants in Chicago, Detroit and Niagara Falls.

C. B. Hutchinson, formerly district manager of the San Pedro district of the Southern California Edison Company, has been made manager of the newly formed Fullerton district. **H. A. Brody** will be manager of the new Lindsay district and **Frank S. Hamilton** will be manager of the Hanford district. **C. E. Houston** has been transferred from the Oxnard district to manager of the Redondo district and **R. C. McFadden,** recently acting district manager in Long Beach, is now district manager in Oxnard. **H. J. Moulton,** who has been assistant district manager in Redondo, is transferred to the position of district manager at Redlands, and **F. H. Hardy,** chief clerk at Redlands, is promoted to the position of assistant district manager at the same location. **P. S. Minner,** acting district manager at Redlands since Mr. Mulligan's death, is promoted to the position of district manager at San Pedro and **J. R. Haskins** is advanced from the power contract department to district manager at Lancaster.

R. J. Holterman, formerly sales manager of the Holabird Electric Company, has been appointed manager of the San Francisco branch of the Fobes Supply Company. The Fobes Supply Company, which has branches in Portland and Seattle, recently purchased the Holabird concern. Mr. Holterman has been in the electrical business in San Francisco for sixteen years, starting with the California Electrical Works, which later became the Western Electric Company. He has been with the Holabird company for twelve years. The entrance of the Fobes Supply Company, which is a purely Western concern, into the San Francisco field, is an event of considerable importance to the electrical industry of the Pacific Coast.

HAPPENINGS IN THE INDUSTRY

RECORD ORDER FOR COPPER WIRE PLACED BY POWER COMPANY

Ten million pounds of copper wire, the largest single order on record, will be required to fill the order which the Anaconda Copper Mining Company, of Great Falls, Montana, has just received from the Pacific Gas & Electric Company of San Francisco. The wire will be used entirely in the construction of the Pit river transmission system over which a 220,000 voltage will be carried.

The finished cable will have a 500,000-circ. mil cross-section, made up of seven conductor, seven-rope lay strand, and is the largest rope strand which the company has had to build.

The largest order of copper wire previously reported was placed when the Chicago, Milwaukee & St. Paul Railroad built their Puget Sound extension. It is interesting to note that it would require approximately 200 cars, or about eight average sized freight trains, to haul the finished order. Over 65,000 miles of wire will be used in the cables, or enough to reach two and one-half times around the earth, and 2500 reels will be required to wind it upon.

The Anaconda Company is the only company west of the Mississippi making bare copper wire.

DEVELOPMENTS ON BEAR AND SNAKE RIVER PLANNED

Among the applications before the Federal Water Power Commission is one from the Utah Power & Light Company, for a preliminary permit to develop 21,500 horsepower at Soda Springs, Lava Narrows and Mink River power projects on Bear river, the latter possibly being divided into two plants for public utility purposes. This company is already producing about 100,000 horsepower on the Bear river system.

The importance of these plants to the complete Bear River system does not so much lie in the power developed, considerable though the total is, but in the fact that at each of these plants there is contemplated a small reservoir which, in conjunction with the Bear Lake reservoir, will greatly add to the reliability of the system as a whole, making possible more accurate regulation of the flow of Bear river.

The Idaho Power Company applies for a preliminary permit to develop 66,000 horsepower at Upper Salmon Falls of the Snake river for public utility purposes, and for another to develop 25,000 horsepower at Twin Falls, on the same river, for similar purposes.

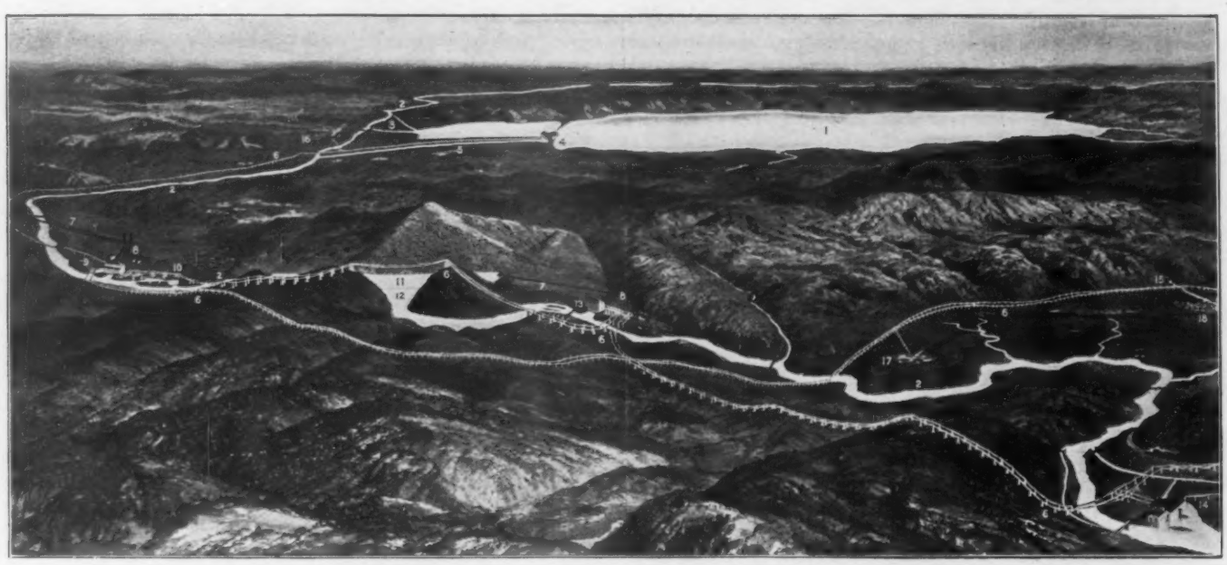
JOBBING HOUSES ENLARGED

A notable merger of Western jobbing interests is the purchase by the Fobes Supply Company of Portland and Seattle of the Holabird Electrical Company of San Francisco. F. N. Averill, president of the Fobes Supply Company, is a leader of the electrical industry in the Northwest, being the chairman of the finance committee of the recently organized Northwest Electrical Service League. R. J. Holterman, formerly sales manager for the Holabird Electrical Company, has been made manager of the new San Francisco offices.

ELECTROLYTIC ZINC REFINERY IN IDAHO

An electrolytic zinc refinery to cost approximately $1,000,000 is to be built at Kellogg, Idaho, by the Bunker Hill and Sullivan M. and C. Company, work to start some time this year, if building prices warrant, according to F. W. Bradley, prominent western mining engineer and president of the company. The plant will be in conjunction with the present lead concentrator and smelter of the company at Kellogg.

The initial capacity will be 25 tons of metallic zinc per day, so arranged that the capacity can be increased to 50 tons a day when market conditions warrant. This plant will cost approximately $1,000,000 for the first unit, and the company is going ahead with the plans so as to have them in readiness for use as early next year as building costs justify.



This panoramic sketch (not to scale) of Bear Lake and the Bear River development of the Utah Power & Light Company gives an idea of the excellent way in which the resources of this river are being harnessed in order to generate the power which is so greatly needed in the surrounding areas. 1—Bear Lake. 2—Bear River. 3—Inlet canals to Bear Lake. 4—Outlet canal from Bear Lake. 5—Transmission lines. 6—Pipe Lines. 7—Surge tanks and penstocks. 8—Grace electric generating station. 9—Storage pond at Oneida development. 10—Dam at Oneida development. 11—Oneida electric generating station (under construction). 12—Wheelon electric generating station. 13—Logan electric generating station. 14—Montpelier, Idaho. 15—Preston, Idaho. 16—Logan, Utah.

The Bunker Hill and Sullivan Company has bought a substantial interest in the Northwestern Lead Company of Seattle, a concern manufacturing lead pipe, sheet lead, lead traps, bends and many other products for the plumbing trade, so that a considerable amount of Bunker Hill and Sullivan lead will be marketed in this Northwest territory.

The Northwest Lead Company has been the selling agent for the Bunker Hill and Sullivan pig lead in Washington, Oregon, Idaho, Montana, Wyoming and Alaska, and recently arrangements have been made for entering the California field.

ELECTRICALLY WELDED CAP FOR DREDGE

The Union Plant of the Bethlehem Shipbuilding Corporation has replaced the riveted steel cap of the electrically operated clam shell dredge which they have just completed

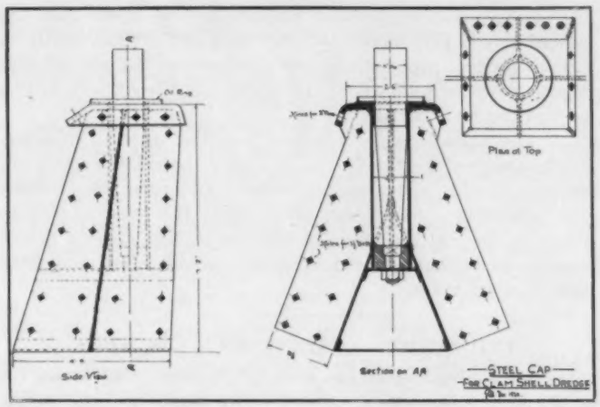


Diagram of the electrically welded cap which was developed for use with the clam shell dredge recently constructed at Pittsburgh, California

for the Bay and River Dredging Company, with one which is electrically welded.

This is considered an innovation. It is made out of an all steel plate, electrically welded together, with the exception of the bottom plate, which is riveted.

Heretofore these caps have been made of cast iron, or cast steel. They are used at the top of the A frame to support the boom, which in this case is 200 ft. long and capable of lifting 25 tons at the end of the boom.

The cap is 72 ft. above the deck of the dredge, and four timbers 26 x 22 carry the load as the boom swings from side to side so that the alternative load makes a very difficult connection, and with a casting but 4 ft. long it is almost impossible to keep this steady in the timbers.

WATER-USERS PLAN TO TAKE OVER IRRIGATION AND POWER

Water-users of the Strawberry project are planning to take over the project from the U. S. Government, believing that they can operate it much more economically than can the government. A meeting was held a short time ago at which it was unanimously agreed by the 150 water-users present to form a corporation for the purpose of dealing with the government in taking over the entire project, including the electric power plant and the grazing land which is annually leased to stockmen. The power plant furnishes electric service to Salem, Spanish Fork, Springville, and some smaller communities in that section of Utah.

The taking over of this project will require the payment of $351,462.31 still due for construction. The capacity of the project is 80,000 acre-feet, of which 69,478.8 already have been subscribed for.

UNIQUE SCHEME OF HARNESSING TIDES PROPOSED BY BRITISH MINISTRY

A scheme for harnessing the forces of the tides on a scale which will make it one of the greatest water-power undertakings in the world, has been worked out by the Civil Engineering Department of the British Ministry of Transport. The scheme provides for the erection of a great barrage in the estuary of the Severn river, from which it is estimated that 400,000 horsepower will be generated.

Two separate installations will be required, a concrete dam across the Severn, within which turbines will be installed for utilizing the power of the tides and which will serve as a bridge for railway and vehicular traffic, being the major undertaking. In addition it is planned to pump water from a low level to a high level during the period of the neap tides, when it is estimated that there will be a surplus of energy available, releasing it when required.

The Severn is unique in combining all the conditions essential to the economic development of tidal water on a large scale. These consist of an exceptionally high range of tide, an estuary of large capacity, an ideal geographical situation in relation to the industrial centers of the country, and suitable land along the banks of the estuary for the development of industrial plants.

CONTRACTS LET FOR SPOKANE RIVER DEVELOPMENT

The Washington Water Power Company is proceeding rapidly with its plan of developing the upper falls of the Spokane river at Spokane. A contract has been let to the Grant Smith Company for the construction of the proposed dams and power house. This contract includes the building of a coffer dam in the south channel to divert the flow during construction, all rock excavation, concrete and structural steel work, and a steel penstock, 19 feet in diameter and 400 feet long. It is estimated that approximately 15,000 barrels of cement will be required. Contracts for an immense water wheel and for an electric generator of 14,500 hp. have also been let.

The power house that is to house the turbine, generator, 95-ton electric crane and other equipment will be of steel and concrete, 40 by 60 feet. The engineering staff of the company is getting out details as rapidly as possible, the work has actually started, and is to be pushed so that the plant will be in operation next fall.

POWER COMPANY FURNISHED EMERGENCY SERVICE

The city of Idaho Falls, Idaho, faced a serious situation recently when the freezing of Snake river caused a complete tie-up of the municipal power and pumping plants, cutting off the city's water supply and depriving it of fire protection. Faced with grave danger, the city sought and obtained emergency service from the Utah Power & Light Company's lines, and in a few hours the plants were again in operation.

COLORADO COMMISSION CONSIDERS UTILITY DEPARTMENTS AS INDEPENDENT

Colorado Public Utilities Commission has declared in passing upon an application from the Trinidad Electric Transmission Railway for permission to abandon certain service, that the expenses and earnings of the street railway department of a utility which operates also electric and gas departments must be considered separately, even though the utility has received valuable franchises and street-lighting contracts upon the understanding that the car lines could not be operated at a profit for some time, and notwithstanding that the return to the company as a whole is reasonable.

NEW DISTRICTS FORMED BY EDISON COMPANY

To keep pace with its rapidly growing business and for the purpose of rendering better service to its consumers, the Southern California Edison Company has found it advisable to establish three new districts, to become operative at once. These will be known as Fullerton, Lindsay, and Hanford districts.

Fullerton district will be formed by taking portions from the present large districts of Whittier and Santa Ana and the district headquarters will be in the city of Fullerton, which is the logical commercial center of this community. C. B. Hutchinson, who has been district manager at San Pedro for the last two years, will become manager of Fullerton district.

Lindsay district is in Tulare county and will comprise the cities of Lindsay and Strathmore and the surrounding rural territory, most of which was served formerly from the district office in Porterville. H. A. Brody will be manager of this district, being transferred from a similar position in Lancaster. The district office will be in the city of Lindsay.

Hanford district will include all of the business in Kings county served by the Edison Company and will be in charge of Frank S. Hamilton as district manager. Mr. Hamilton is an old employe of the Edison Company and has been in Hanford for the past year as local agent, this region having been a part of Visalia district.

THE ADVANCE OF THE ARIZONA CONTRACTOR-DEALER

The high standard which the electrical contractor-dealer is maintaining even in the most out-of-the-way corners of the West is shown in the accompanying pictures of the New State Electric Supply and Fixture Company's shop in Phoenix, Arizona. For some time a continuous effort has been made by members of the electrical industry in the West to make the electrical retail shop better than the average retail store. The far-reaching result of this effort is shown in the way this Arizona dealer displays and demonstrates his appliances, as well as in the well ordered atmosphere of the entire store.

The New State Electric Company of Phoenix, Arizona, has a central location in the business district of the city. A glance at the building demonstrates the company's belief in billboard advertising as well as in the simple yet distinctive window display.

This company recently moved into its new home

The possibilities of making the electrical shop interior a place of comfort and beauty are shown in this Arizona store interior

and the ideals of beauty, good taste and merchandising efficiency which are being maintained put it among the country's finest and most up-to-date electrical stores.

UTAH SPECIAL CONTRACT CASE GOES BEFORE SUPREME COURT

Arguments before the Supreme Court of Utah on the appeals of holders of special power contracts with the Utah Power & Light Company have been concluded, and the case is now under consideration by the Supreme Court. The cases went up on writs of certiorari from the decision of the public utilities commission of Utah which places these special contract holders on standard schedules.

It was pointed out by Judge John F. MacLane, counsel for the power company, that should the commission find that the rates formerly paid by the contract-holders were reasonable, and that the new rate structure is too high, the additional amounts paid in are to be refunded. For this reason the commission retained jurisdiction in the contract cases pending the decision of the rate case.

Judge MacLane further argued that if the contention of the special contractors was correct, to the effect that the commission is prevented by the wording of the Utah law from exercising any jurisdiction over the rates in the special contracts, it would follow that the utilities act itself was in this regard unconstitutional.

The arguments of counsel for the special contract-holders were along the line of attacking the right of the commission to alter contracts, particularly under the law creating the commission, which they claim is to the effect that contracts in force at the time the commission was created should remain so if they showed adequate consideration and were lawful when made.

INJUNCTION AGAINST RICE GROWERS

An application of the town of Antioch, California, for a temporary injunction against water appropriators on the upper Sacramento river has been granted. This injunction is in reality directed against rice growers in the valley owning about 450,000 acres of land. This decision is of especial significance to the electrical industry because a considerable part of the rice growing industry of California, which consumed 25,135,357 kw-hr. in 1920, will be seriously curtailed unless the injunction is reversed when the case is tried upon its merits.

PORTLAND COMPANY ADOPTS BI-MONTHLY BILLING

Notice has been sent to the 40,000 residential customers of the Portland Railway, Light & Power Company, that effective January 1, bills will be rendered only once in every two months instead of once a month for electric service used. It is believed that this will be an acceptable plan to the very big majority of the customers, as it will cut in half whatever inconvenience may be attached to allowing meter readers to enter premises each month, and to paying these small bills each month before the delinquent date.

It is expected that there will be an annual saving of $14,000 effected in reduction of meter reading, billing and distributing force. The various steps on the rate schedule will be doubled and a discount of 10 per cent instead of 5 per cent for prompt payment will be allowed.

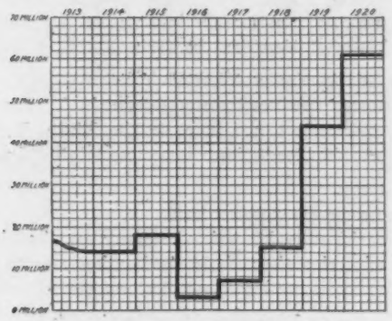
The Portland Railway, Light & Power Company is the only large company on the coast and one of the few large companies in the country to adopt the bi-monthly billing system.

WAREHOUSE COMPANY ORGANIZED

First Warehouse Company, organized to operate in Los Angeles county, has been authorized by the Railroad Commission to issue $10,000 of stock. Of the stock $1,000 is to be issued at once. The remainder will be issued in accordance with the growth of the business.

INCREASE IN PORTLAND EXPORT BUSINESS

How Portland's export business slumped as a result of the war and the withdrawal of tonnage from the Pacific coast and then rebounded to four times its former volume is clearly



Graphic representation of Portland's export business for past seven years

shown in the diagram prepared by John P. Doyle, assistant secretary of the Port of Portland. In 1913, the last normal year before the war in Europe, Portland's exports were valued at $14,445,715. The lowest figure in recent years was reached in 1916, when the value of exports from Portland fell to $3,506,919. For the year just ended exports moving from that city were valued at $61,413,272, according to official government figures for 11 months, and an estimate for the month of December made from records kept by the Merchants' Exchange of export declarations filed at the customs house.

WASHINGTON WATER POWER COMPANY HOLDS ANNUAL DINNER

The annual dinner to the sales force of the Washington Water Power Company was given by Lewis A. Lewis, sales manager, at the Davenport Hotel, Thursday night, December 30. There were several speeches by members of the staff.

Mr. Lewis complimented those present on the excellent sales record which they had made during the year. He was presented with a small token of esteem as a memento of the occasion. Those at the dinner were:

J. F. Farquhar, E. B. Olson, W. J. Currie, W. L. Scott, S. Osterloh, C. W. Johnson, C. E. Fox, T. E. Holsey, Harry Anderson, Earl Hunt, W. A. Johnson, Al Richards, R. B. Carter of the Eureka Vacuum Cleaner Company, R. B. McElroy, Grace Hayes, Alice Culler, Pauline Strom, Joe Reynolds and Pearl Williams.

POWER COMPANY HOLDS DINNER AT SALINAS

Representatives of the different branches of the electrical industry in the territory served by the Coast Valleys Gas and Electric Company met at a dinner given by James F. Pollard, with members of the company, at Salinas on December 15, to confer with W. F. Brainerd, representative of the California Electrical Cooperative Campaign.

A discussion of the self-interest theory caused a hearty response and indicated a full appreciation of its significance.

The need for a set of definite rules governing the installation of pumping plants in the agricultural district was brought up by Mr. Doyle and it was unanimously agreed that the establishment of such a set of rules for the protection of legitimate contractors and the safety of the employes of the power company, as well as consumers of electricity was a vital need. Mr. Gwynn and Mr. Doyle were appointed a committee to draft a set of rules.

Those present at the dinner were:

G. E. Doyle and J. A. Anderson of the contracting firm of Anderson and Doyle of Salinas; W. F. Evans of the Salinas Electric Company; James F. Pollard, assistant to the president, Coast Valleys Gas and Electric Company; C. M. Armstrong, manager of the King City district; E. A. Smith, manager of the Monterey district; P. S. George, treasurer of the company and local agent at Salinas; E. K. Gwynn, general foreman at Salinas, and W. F. Brainerd, of the Cooperative Campaign committee.

AMERICAN COMPANY TO OPEN MILLION DOLLAR PLANT IN PORTLAND

One of Portland's greatest manufacturing plants will be in operation within a few weeks, with the completion of the new factory of the American Can Company. The factory, which is now rapidly nearing completion, will, when in full operation, turn out a vast quantity of cans to care for the Pacific Coast's fruit, fish and vegetables.

The plant, which was begun last fall, will cost over $1,000,000 when completed and will cover approximately seven and one-half acres, with its two main buildings and various warehouses. The two main structures, which will house the factory proper, are of reinforced concrete construction, what is known as Class A, fireproof type, each three stories high.

The plant, when running at a normal basis, will turn out 630,000 cans per day, while the number of employes is 2,000.

SAN JOSE CONTRACTORS USE UNUSUAL ADVERTISING OPPORTUNITY

Because of certain fires which have occurred in San Jose, slurs were made upon the work of the electrical contractors of that city. Seeing here an unusual opportunity for advertising the value of proper wiring, the Santa Clara County Electrical Contractors and Dealers' Association published the accompanying notice in a San Jose paper. It is felt that the desired effect upon the public mind has been obtained.

DANGER!

DON'T MEDDLE WITH THE ELECTRIC WIRING!

Why is it that a man who would call in a carpenter to hang a door, who would summon a plumber to put a new washer in a faucet, will not hesitate to repair the electric wiring?

It is a fact that most of the accidents and fires resulting from electric wiring would never have occurred had the wiring remained just as it was installed by the electrician.

Buildings are wired by competent electricians who take every precaution to guard against any leakage of current, any places where the electricity can leave the wires and cause trouble. This wiring is always finally inspected by the City Inspector and if it is left just as it is installed there is not the slightest danger of accidental "shocks," "shorts" or fires from crossed wires.

The wires from the street are always led directly to the fuse box, amply protected by iron conduit and porcelain insulators. The house wires are connected to the main wires by the fuses.

A fuse is a small porcelain plug made to screw into a fuse block. Inside the fuse is a small lead wire, protected with a covering of mica. A fuse is inserted in every house lighting system, so as to give entry to enough electricity to supply all the lights in that house and not enough to fuse the wires inside and start a fire. If lightning strikes the wires outside the house or if something goes wrong with a transformer the fuse simply blows out and thus protects the house wiring.

A large number of fires put down to defective wiring are simply due to the insertion by the resident of the houses or store owners themselves of any metallic substance, such as a piece of copper wire or even a hair pin, so as to prevent the fuse from blowing out. People who have had their fuse blow out and cut off their lights one or two times do this to avoid a further inconvenience.

Then there is the other class of resident or store owner who is never satisfied with the wiring as originally installed. He wants many changes, and instead of calling in a competent electrician, he sets about to do the work himself, or has his son or some of his employees do it. The result is anything but satisfactory, and frequently leads to disaster. Instances are on record where thinly insulated wires have been strung inside the walls and ceilings without any other protection. In time the insulation chafes through, or it gets damp and rots, and then the current shorts and starts a merry blaze. Others have strung wires along beams, fastening them with nails, and improvised other dangerous contrivances jeopardizing their homes and stores.

The amateur plumber is not even in danger of drowning and the very worst he can do is to start a small flood. The embryo carpenter can build his cobhouse without fear of fire calamities, and escape with a pounded thumb and a cut finger, but the make-shift electrician is the most dangerous of all, for he knows not what may result from his meddling.

Whenever there is new wiring to install, lines to be extended, changes to be made, the work should be trusted to a competent, licensed Electrical Contractor who employs expert mechanics and is responsible for their work.

ART FIXTURE COMPANY
R. M. BUTCHER
CENTURY ELECTRIC COMPANY
FASER BROS.
GUILBERT BROS.
GARDEN CITY ELECTRIC COMPANY
JOHN GUILBERT
O. C. RODGERS
SAN JOSE ELECTRIC COMPANY
SCHUTTE BROS.
WAGNER BROS. FIXTURE COMPANY

The above contractors and dealers are members of Santa Clara County Electrical Contractors' and Dealers' Association, affiliated with the State Electrical Contractor's and Dealers' Association.

Notice which appeared a short time ago in a San Jose paper

ONE MILLION FOR STREET LIGHTS IN HOLLYWOOD

According to plans now being worked out by the Hollywood Board of Trade an investment of $1,500,000 will soon be made for an ornamental lighting system in that part of Los Angeles. The plan calls for the installation of posts on every street in Hollywood. On the principal streets 400-candlepower lamps will be used with 250-candlepower units on the less important thoroughfares.

At the present time the work is in charge of Allan Shore, chairman of the lighting committee of the Hollywood Board of Trade. A bond issue will be submitted to the voters after which active work will start immediately. A unique provision of the bond issue is a clause which will place a portion of the tax on personal property.

THE GROWTH OF A POWER COMPANY

The following earnings statement of the Pacific Gas & Electric Company for the ten months ended October 31, 1920, reveals a continuation of the uninterrupted growth which has characterized the company's history for many years, as shown by the comparison with the corresponding ten months of 1919:

	1920	Increase
Gross Revenue	$28,914,815	$7,200,386
Operating Expenses, Taxes, Depreciation, Etc.	20,469,822	6,084,139
Net Revenue Available for Bond Interest	8,444,993	1,116,247
Bond Interest and Discount	4,319,784	613,893
Balance	$ 4,125,209	$ 502,354
Additional Depreciation Reserve	833,334	
Surplus	$ 3,291,875	$ 502,354
Preferred Stock Dividends (10 months)	1,508,682	228,912
Balance	$ 1,783,193	$ 273,442

The increase of $7,200,386 in the volume of the company's business in the first ten months of the present year, as compared with the same period of 1919, is attributable in about equal proportion:

(a) To the normal growth of business;

(b) To the taking over of the properties of the Northern California Power Company and the Sierra and San Francisco Power Company, the former by purchase on October 1, 1919, and the latter by lease on January 1, 1920.

The increase of $1,116,247 in net income is, in a substantial measure, merely a reflection of the larger investment the company has in its properties. Its "Plants and Properties" account on October 31, 1920, stood at $163,070,197; an increase since January 1, 1919 (the period covered by the above comparison) of $23,754,201. This latter sum represents the additional investment made in a period of twenty-two months.

LOS ANGELES COMPANY APPLIES FOR BOND ISSUE

Application has recently been made to the State Railroad Commission by the Los Angeles Gas and Electric Corporation for permission to issue $1,000,000 worth of stock. Officials of the company state that the money to be realized will be used to make extensions and improvements in the system.

WESTERN STATES GAS & ELECTRIC COMPANY BOND ISSUE

Western States Gas & Electric Company has been authorized by the Railroad Commission to issue $264,000 of its first and refunding mortgage 5 per cent sinking fund gold bonds, due January 1, 1941. The proceeds from the sale of the bonds are to be used to reimburse the company's treasury for expenditures made in connection with plant extensions, additions and betterments. The Western States company operates in Stockton, Richmond and Eureka.

WESTERN STATES GAS AND ELECTRIC COMPANY RATE INCREASE

What is in effect an order increasing the rates for gas and electricity to be charged by the Western States Gas and Electric Company of Stockton, by approximately ten per cent, has been issued by the Railroad Commission.

The increase in cost to the company of electric energy bought from the Pacific Gas & Electric Company and the Great Western Power Company, and resold, amounts to $75,000 a year.

FEDERAL POWER COMMISSION ASKS FOR APPROPRIATION

The Federal Power Commission is asking Congress for appropriations aggregating $482,065. Of that amount $100,000 is required to reimburse other executive departments for the expenses of investigations requested by the Commission. The greater part of the $137,000 allowed for operating expenses will be used for field investigation.

TRADE NOTES

New Battery Sales Corporation —

The Duplex Battery Sales Corporation, Seattle, Wash., has been incorporated by Kerr, McCord & Ivey, 1309 Hoge Building, Seattle, Wash. The corporation has been capitalized at $10,000 and will engage in buying, selling and manufacturing all kinds of electrical batteries.

Ames Iron Works Opens Western Office —

The Ames Iron Works of Oswego, N. Y., announces the opening of a Pacific Coast office in the Rialto Building, San Francisco. L. M. Page has been appointed Pacific Coast manager.

New Department Opened —

The Lushington Electric Company, of Seattle, recently opened an electrical household device department to be run in connection with its big First Avenue store.

Reflector Company Representatives in Canada —

Cochrane, Stephenson & Company, Ltd., 602 Avenue Block, Winnipeg, Man., have been appointed as representatives in Western Canada of the National X-Ray Reflector Company.

International G. E. Company Moves —

The International General Electric Company, Inc., which was formed in 1919 to take over and expand the foreign business of the General Electric Company, has moved into its new office building on River Road, Schenectady, New York.

New Quarters for Northwest Lighting Company —

In ten years the E. W. Murray Lighting Company, of Spokane, has grown from a store 11 by 22 feet to a present size of 29,000 square feet of floor space on three floors, having recently opened its new quarters at W. 307-9 Riverside Ave.

On the opening night, an orchestra furnished music for dancing and the store was brilliantly lighting, showing an extensive line of electrical staple and novelty goods.

Significant Meter Performance —

The engineer of the Union Gas & Electric Company of Cincinnati has written the Duncan Electric Company stating that they have an M2 meter in their possession which left the Duncan factory in 1916 but which still has the original Duncan seals upon the cover showing that it has never been adjusted. The meter has run 5,892,000 revolutions.

Scope of Contractor-Dealer Company Enlarged —

The Globe Electric Works of San Francisco and San Diego have acquired the Kern Valley Electric Company of Bakersfield. R. Flatlad is general manager of the entire organization and M. Flatlad is local manager.

Appliance Company Opens in Salt Lake City —

The new showrooms of the Edison Electrical Appliance Company were opened during the first week of January, in Salt Lake City. They are reputed to be among the finest equipped electrical demonstration rooms in the West.

Portland Company Expands —

The J. C. English Company of Portland celebrated the twelfth anniversary of its start in business in that city by an elaborate remodeling of its present place of business.

Chicago Firm Changes Name —

The firm of Fowle and Cravath, electrical and mechanical engineers of Chicago, has discontinued business because of the fact that J. R. Cravath has moved to California. The new firm of Frank R. Fowle and Company has replaced it.

Electric Furnace Installation —

The Electric Furnace Construction Company, of Philadelphia, has recently installed a "Greaves-Etchells" electric furnace at the Holmes Foundry Company's plant at Port Huron, Michigan, for refining and superheating molten cupola metal.

Meeting Notices for Electrical Men

(Important discussions at meetings of the A. S. M. E. and A. S. C. E., and the Christmas party of the San Francisco Electrical Development League are features of local news. Interesting engineering papers are reported from the Northwest societies, while the outlines of the N. E. L. A. plans for the coming year are of especial interest to all branches of the industry.—The Editor.)

San Francisco Electrical Development League Holds Christmas Party

As a conclusion to a successful year, the San Francisco Electrical Development League played host at the Palace Hotel, December 20, to seventy children from the San Francisco Nursery for Homeless Children. There was a record attendance, over 655 people attending the luncheon. Besides the little guests of the League, most of the second generation of the electrical industry were present to receive their presents from the big Christmas tree which were handed out by Santa Claus in the person of Joe Thompson, and his four little imps, H. C. Hopkins, Miles Steel, C. H. Tallant and C. B. Kenney.

The address of welcome was made by Albert H. Elliot, secretary, Pacific Division, Electric Supply Jobbers' Association, who stated that the future of the commonwealth was in the hands of the kiddies of today, that the making better citizens of them was to our own self-interest, that the spirit of Christmas was that of giving, and that while he felt sure that the kiddies would enjoy themselves, he knew that the members of the League would get more pleasure out of it than they would. Miss Jessica Lee Briggs made the response for the children of the Nursery and thanked the Development League for bringing all of the children instead of simply a few. Miss Briggs then spoke of the work then being done by the Nursery and asked for the cooperation of the League in the pencil sales which they hold each year and upon which they depend for the funds necessary to carry on their work.

After the luncheon had been completed Santa Claus made his appearance, accompanied by his four little imps. Santa told the delighted children, whose eyes grew large in wonderment as the tree was lighted and the pile of presents became apparent, that these little imps, all dressed in white, were his four little reindeers which he had ordered to change themselves into little men. All the children present received some gift, and one member of the League expressed the views of them all when he said, "I am mighty glad that I got fined so many times during the year." The personnel of the Christmas tree party committee was as follows:

Chairman—Henry Bostwick, manager, San Francisco division, Pacific Gas & Electric Co. In charge of transportation — Arthur Kempston, Pacific Fire Extinguisher Co. Christmas tree decoration—R. M. Alvord, General Electric Co.; L. E. Van Atta, Pacific States Electric Co.; E. W. Garcia, Pacific States Electric Co.; Chas. Loring, chief clerk, General Electric Co; Henry Vowinkel, Decoration Construction Company, and Tracy Simpson, manager, Federal Electric Sign Co. Entertainment—Ira J. Francis, John A. Roebling's Sons Co. Publicity—M. T. Dolman, Pacific States Electric Co. Santa Claus—Joe Thompson, president, Electric Manufacturing Co. Imps—H. C. Hopkins, publicity manager, Westinghouse Electric & Manufacturing Co., Miles Steel, Benjamin Electric Co., C. H. Tallant, McGraw-Hill Co., and C. B. Kenney, NePage-McKenny Co.

BUILDERS OF THE WEST — XCIII

J. P. JOLLYMAN

A score of names will of necessity be written into the annals of this generation by historians in order to record the wonderful progress of the West in harnessing the water powers of nature for the uses of man. But among those names recorded for the establishing of new records in hydroelectric transmission at high voltage and over long distances, the name of J. P. Jollyman must stand forth pre-eminent for a definite contribution in sound technical grasp so necessary in the computations involved in this work; and to J. P. Jollyman, therefore, electrical engineer with the Pacific Gas & Electric Company, this issue of the Journal of Electricity is affectionately dedicated.

Wireless Progress, Subject of Spokane Meeting

The regular meeting of the Associated Engineers of Spokane on December 17 was attended by 125 members and friends. Mr. E. V. Olsen gave a very interesting talk on wireless telegraphy and telephony, demonstrating and illustrating the lecture. R. S. Daniels, chairman of the A. I. E. E., introduced the speaker by wireless telephone from a station two and one-half miles distant. By the use of the magnavox, the speech could be clearly understood by the entire audience.

Officers of Mutual Aid Association Elected

Members of the Traction and Power Mutual Aid Association, composed of employes of the Utah Light & Traction Company and the Phoenix Utility Company, recently held their annual meeting and elected the following officers for the coming year:

Wiliam M. Scott, president; William Cocking, vice-president; J. C. Mathews, secretary; A. M. Rust, treasurer; F. E. Hansen, J. M. Lindsay, George Eldredge, Frank Pickering and R. A. Ross, directors; John Scheib, auditor, and Dr. C. E. Openshaw, physician.

During the past year the association paid death claims amounting to $2300, and sickness, accident and refund claims to members totaling $3520.10. A surplus amounting to $4,085.50 was divided among the 615 members of the association and pro rated according to length of membership.

A. I. E. E. Holds Midwinter Convention

The seventh Midwinter Convention of the American Institute of Electrical Engineers will be held in New York City, February 16 to 18, in the United Engineering Societies Building, 33 West 39th Street. The convention will include six technical sessions; visits through various power plants; a dinner dance, and the Edison medal presentation, followed by a lecture on the recent advances in science.

Hydroelectric Development is Presented at San Francisco Civil Engineers Meeting

A Symposium on Hydroelectric Development was the topic of the annual meeting of the San Francisco section of the American Society of Civil Engineers which was held in the Engineers' Club, December 21.

The officers for the coming year were elected, as follows:

President, F. R. Muns, vice-president of the San Francisco Bridge Company; vice-president, Thomas Means, irrigation engineer; secretary-treasurer, N. A. Bowers, Western editor, Engineering-News Record.

W. E. Creed, president, Pacific Gas & Electric Company, spoke on Economic Aspects of the Present Hydroelectric Situation. He stated that the oil industry has assumed more of the industrial burden of California than it can permanently handle and that hydroelectric power must be ready now to supply the fuel demand which is being made by the ever-

increasing population. He showed that there is a need for the development of an additional 100,000 hp. in this state every year and that the vital question is the financing of this $500,000,000 or $800,000,000 program.

Mr. Creed believes that two factors would aid especially in clearing the financial situation: First, the relieving of the banks of the present war loans, spreading them out in such a way that virtual refunding will be accomplished. The second factor is the building up and financing of foreign trade, which Mr. Creed believes will bring more money into this section of the country than any other factor.

E. C. Hutchinson, chief engineer, Pelton Water Wheel Company, spoke under the title, Modern Hydraulic Equipment, especially emphasizing the increasing use of higher heads with the impulse and reaction type of water wheel, and Rex C. Starr, construction engineer, San Joaquin Light & Power Corporation, told the story of the construction of the Kerckhoff tunnel, describing how records are broken in driving hard rock tunnels.

Future N. E. L. A. Activities Discussed at Executive Committee Meeting

A well attended meeting of the Executive Committee of the National Electric Light Association was held at the association headquarters in New York on the sixteenth of December. This meeting of twenty-five men was indicative of the keen interest which is being taken in the new work now under way and also of the healthy state of association activities. The significant plans for the future which were discussed were:

M. H. Aylesworth, who has been an unqualified success as executive manager of the N. E. L. A. during the past year.

The launching of a national publicity campaign which is to be carried on through the large magazines of the country.

The drawing of a model utility law for state regulation.

The furthering of public relations in various commonwealths served by the association, bringing into activity on all occasions not only the electrical industry but the allied industries of gas, telephone, and electric railways. The report of the membership committee showed the membership totaling 10,481 on the thirtieth of December.

The question of permitting geographic devisions to include employes of municipal plants in their membership was referred to the Public Policy Committee, with the suggestion that a report on this subject be prepared and also that some action be taken looking to the revision of the constitution with regard to Class F members—the present constitutional provision opening the door for municipal plant employes to become Class F members.

The question of a monthly statement of national headquarters expenses being submitted to the president of the Pacific Coast Division was submitted by Robert Sibley, representing this division at the meeting. It was directed that a statement of purposes of the association and a budget should be forwarded in the form of an information letter immediately, both to the presidents of geographic divisions and to member companies. It was also directed that quarterly statements should be forwarded to the presidents of geographic divisions with regard to the activities and the expenditures of money carrying out those activities.

The question of the time and place for holding the 1921 convention was presented by President Insull, who stated that a determined bid had been made by Hot Springs, Arkansas. It was moved that the entire matter be left with President Insull—including the nature and extent of the program, and the subsequent preparation of proceedings with the chairmen of the four National Sections and with the headquarters staff.

American Engineering Council Holds First Meeting

The first meeting of the American Engineering Council of the Federated American Engineering Societies was held at their temporary headquarters in New York City, on December 17, 1920. President Herbert Hoover presided. Every member of the board was present except Professor Arthur M. Greene.

President Hoover reported on visits he had made to various cities. Reports were heard from the standing committees on Constitution and By-Laws, Finance, Membership and Representation, Procedure, Public Affairs, and Publicity.

The board then adjourned to meet on the second Friday in February.

Industrial Illumination Presented in Spokane

"The What and Why of Industrial Illumination" was the subject of an illustrated lecture delivered by O. L. Johnson of Chicago, vice-president of the Illuminating Engineering Society and field representative of the N. E. L. A. Department of Lighting. The subject of industrial illumination has been emphasized especially in business as well as engineering circles during the past few weeks, therefore Mr. Johnson found an audience distinctly appreciative of his able presentation of the subject.

Mr. Johnson is touring the coast and will deliver this lecture in outstanding cities.

Edison Annual Meeting

The annual meeting of district managers of the Southern California Edison Company was held in Los Angeles on Tuesday, December 28. There were in attendance over two hundred, consisting of officials, district managers and minor executives. At this meeting a number of changes in the district personnel were announced, these appearing in another part of this issue of Journal of Electricity.

The program included a number of addresses by different members of the company on such subjects as Engineering Teamwork, The Reward For Efficiency, Making Partners of Customers, Loyalty, Complacency, and The Outlook.

Addresses From the Electrical Industry Delivered at Annual Dinner of San Francisco A. S. M. E.

On the thirtieth of December the San Francisco section of the American Society of Mechanical Engineers met at the Engineers' Club. The past and future activities of the A. S. M. E. was the subject ably presented by W. F. Durand of Stanford University. John A. Britton gave an enlightening survey of the water-power development of the West, and also presented some very interesting motion pictures of the development on the Pit river.

Mr. Britton's talk was followed by Robert Sibley's account of the Washington convention of the Federated American Engineering Societies which he attended as a representative of the San Francisco section of the A. S. M. E. He also gave an account of the local section's meeting in New York as well as the regular annual meeting which was held there. An especial interest was shown in Mr. Sibley's report of the dinner which was given in honor of Ampere by the Crocker-Wheeler Company, and of the dinner which was given in honor of Governor Coolidge at the Hotel Biltmore on the fourth of December.

Mr. Sibley spoke of the importance of more complete organization among the engineers of the West in order that this section may be in accord with Herbert Hoover's hopes and plans for the Federated American Engineering Societies.

Industrial and Financial Conditions were presented by R. A. Balzari, of the Westinghouse Electric & Manufacturing Company.

W. W. Hanscom, chairman of the San Francisco section, A. S. M. E., gave a demonstration of receiving wireless messages from New Brunswick, New Jersey, Marion, Mass., and Honolulu. The music which was received from the California theater was especially welcome. In addition to these many features, a motion picture traced the oil production process from the fields to the ships or trains, and a record was played of the fortieth anniversary speeches of Fred Miller, president of the A. S. M. E., and Ira M. Hollis, past president. These records were made according to a new process which has been developed by W. H. Bristol.

Plans are being made for a meeting Thursday, February third, the occasion being the presence of the national president, E. S. Carman, who will be in San Francisco at that time.

Electric Appliance Company Annual Dinner

As the climax to a series of sales conferences held at the San Francisco offices of the Electric Appliance Company during the last week of the old year, the company's annual

Electrical Appliance Company banquet, held in the Commercial Club Dec. 30

dinner was enjoyed in the Commercial Club on December 30. Present were the members of the local organization and a number of invited guests from the electrical and the automobile industries, to the number of nearly one hundred. As may be noted from the photograph, the guests were seated at a table arranged in the form of an "E," the symbol of Electric.

All of the speakers called upon by Manager C. C. Hillis, as toastmaster, laid emphasis on the substantial growth of the business since it was established at San Francisco in 1904. The close spirit of cooperation and friendly good fellowship, which characterizes this company in its relations both within and without its organization, was made evident by the various speakers. Such an affair as this does much to establish a desirable esprit de corps and a far-reaching good-will.

Governing Committee of Northwest Electric Light and Power Association Meets

The Governing Committee of the hydroelectric and technical section of the Northwest Electric Light and Power Association met in Portland on December 15 and 16. The meeting was devoted to a discussion of the work of the national committees of the National Electric Light Association, as evidenced by reports submitted at the Salt Lake meeting, the tentative program for the annual convention, the work of the committee and the line extension policy of central stations.

Colorado Project Presented at Ad Club

John B. Miller, president of the Southern California Edison Company, was the principal speaker at the Los Angeles Advertising Club on January 4th. Mr. Miller took for his subject the proposed development of the Colorado river, and said in part:

"The immensity of our Colorado river proposition seems staggering to the imagination, but it is just a continuation of what we have been doing in developing industry for the upbuilding of the Southwest.

"Our proposition is not confined to Southern California but takes in seven states and extends to a portion of Mexico."

COMING CONVENTIONS

CALIFORNIA ASSOCIATION ELECTRICAL CONTRACTORS AND DEALERS
Quarterly Meeting—Stockton, Cal., Jan 22, 1921

PACIFIC COAST SECTION, NATIONAL ELECTRIC LIGHT ASSOCIATION
Annual Convention—Del Monte, California, May 25-27, 1921

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Annual Convention—Salt Lake City, Utah, June 20-26, 1921

ELECTRICAL SUPPLY JOBBERS ASSOCIATION, PACIFIC COAST DIVISION
Regular Quarterly and Annual Meeting, Del Monte, Cal., Jan. 26, 27, 28, 1921

Dinner Given in Honor of Prominent Jobbers

On the fifth of January Ira Francis, president of John Roebling's Sons Company, San Francisco, gave a dinner at the Bohemian Club in honor of R. D. Holabird, retiring owner of the Holabird Electric Company, San Francisco, and F. N. Averill, president of the Fobes Supply Company of Portland and Seattle. This dinner was especially timely as it was given directly following the purchase of the Holabird Elcctric Company by the Fobes Supply Company.

During the dinner Mr. Francis read a number of more or less mythical telegrams from those gathered around the table. It has been reported that the pcculiar appropriateness of each message was the cause of a continuous series of laughs. It seems that their contents will not be divulged except under confidential conditions.

The guests at this banquct were:

R. D. Holabird, Holabird Electric Company; F. N. Averill, Fobes Supply Company; Walter Seaver, U. S. Steel Company; Chester Pennoyer, National Conduit and Cable Company; R. G. Harris, Standard Underground Cable Company; Sam Gilman, John Roebling's Sons Company; F. N. Aden and H. A. Sales, Holabird Electric Company; E. F. Sellers, E. J. Duggan and W. C. Foss, Fobes Supply Company; Chas. Wiggin, Dunham, Carrigan & Hayden; Roscoe Oakes, National Carbon Company; C. C. Hillis, Electric Appliance Company; H. B. Squires, H. B. Squires Company; D. E. Harris, Pacific States Electric Company; Robert MacDonald, Oakland manager, Holabird Electric Company; S. B. Gregory, Arrow Electric Company; R. J. Holterman, Holabird Electric Company; Miles Steel, Benjamin Electric Manufacturing Company; Robert Sibley, Journal of Electricity; C. G. A. Baker, Baker-Joslyn Company; Arthur E. Rowe, Garnett Young Company; Samuel Taylor, Electric Railway Manufacturing Supply Company, and R. J. Davis, Century Electric Company.

Seattle Meeting of A. I. E. E.

The Seattle section of the American Institute of Electrical Engineers held its regular monthly meeting at the Arctic Club in that city on December 21, Chairman G. E. Quinan presiding.

A motion was made and carried that the section sever its connection with the Associated Engineering Societies. It was also decided that the May meeting be the annual meeting of the society. O. B. Coldwell of the Portland section was nominated as vice-president of the Northwest District. G. E. Quinan and W. T. Batcheller were re-elected chairman and secretary-treasurer, respectively.

Chairman Quinan presented a letter from W. G. Vincent, retiring chairman of the San Francisco section, stating that in accordance with action taken at the December 17th meeting in San Francisco, he had filed a petition in New York with the board of directors of the Institute, asking that the name of Robert Sibley, editor of the Journal of Electricity, be placed on the 1921 ballot for vice-president. He further stated that this petition has been signed by some one hundred and eighty names headed by those of John A. Britton, H. J. Ryan, S. M. Kennedy, Arthur Kelly, Clem Copeland, O. B. Coldwell, J. A. Cranston, C. G. Nobel, C. F. Uhden, C. E. Magnusson and G. E. Quinan. The Executive Committee heartily endorsed this nomination and the nominating petition was circulated.

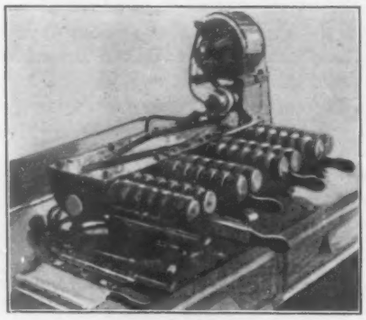
Following the election, the meeting was turned over to a discussion of a paper by J. D. Ross, read at the previous meeting. Dr. Heath of the Chemical Society invited the section to join in a meeting of the near future at which Dr. Plaskett, director of the Dominion Observatory at Victoria, B. C., is to speak.

LATEST IN EVERYTHING ELECTRICAL

(New domestic appliances include a combined electric washer and ironer, and a convenient electric cooker with various improvements. New switchboard ammeters and voltmeters combine accuracy and ruggedness of construction, while a specially designed motor starter for printing presses is a useful addition to the automatic equipment of the press room. —The Editor.)

MOTOR DRIVEN RAZOR BLADE SHARPENER

A new motor-driven machine for resharpening safety razor blades, manufactured by F. W. Cochrane, 3917 South Western Ave., Los Angeles, Cal., is a departure from all processes used heretofore. In the Quadruplex Velvet Edger, as the machine is named, worm stroppers and honers eliminate all flip-flopping motion, the blades in sharpening being held firmly against rolls. There are four sets of rolls, the first being faced with felt, the middle two being the honer and stropper in the order named, and the last faced with shell horsehide. Each facing spirals on the roll which, as it turns, presents a continuous surface to the blade. Spiral gears running in oil turn the rolls and hard bronze bearings are used throughout. Screws allow a micrometer adjustment of the rolls in parallel or in pressure.



The machines come in two sizes, a 12-blade machine like that shown above and a 6-blade machine, each being driven by a Westinghouse motor.

A NEW ELECTRIC COOKER

The Kercher Electric Cooker which is being manufactured by the Kercher Electric Company of Berkeley, California, is a little larger than a good-sized oven. The aluminum cooking vessels fit into an electrically welded copper-heating distributor. The heat is supplied by a large punched heating element which operates at a temperature only slightly in excess of the temperature of the cooking food.

A thermal switch operated by a Kercher pressure cell controls the current and is said to keep the temperature practically constant. A clock attachment makes it possible to set the cooker so it will start and stop automatically.

LAUN-DRY-ETTE IMPROVEMENTS

Improvements have been announced by the Laundryette Manufacturing Co., Cleveland, manufacturers of the Laun-Dry-Ette, a machine designed to wash and dry without a wringer.

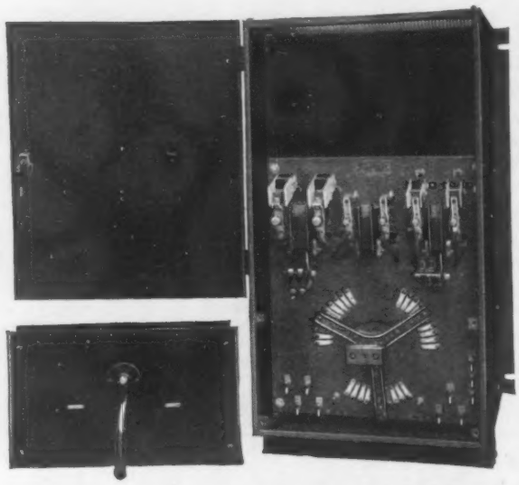
The gray iron casting which holds the Laun-Dry-Ette's two vacuum cups has been replaced by a similar malleable iron part. The gray iron cone crank has also been changed to malleable iron. The lever which raises the drier to its place is now a steel forging. Formerly it was made of gray iron.

A rather complicated lock lever formerly held the vacuum cups to the back shaft. This has been replaced by a bronze lock-screw.

MOTOR STARTER WITH SPEED-SETTING LEVER FOR PRINTING PRESSES

An addition to the Cutler-Hammer line of "Pre-Set" printing press control is an automatic motor starter for the control of slip ring motors driving cylinder presses, small web presses, folders, paper box making machines requiring a high starting torque and occasional changes in speed. The speed is determined by the setting of a 3-arm rheostat.

The control panel together with the grid resistors is enclosed in a sheet metal case. The starter can be set for the particular speed at which the machine is to be operated by means of the speed setting lever, which is external to the case. A hinged cover permits exposing the switch equipment for inspection, and may be locked to prevent tampering with the starter. Wiring is facilitated by providing holes in the bottom of the case for the entrance of conduit.



Automatic starter, with cover open, for controlling a.c. motor-driven printing machinery

ELECTRIC WASHER AND IRONER IN ONE COMPLETE UNIT

A complete laundry unit, the "A B C Electric Laundress," newly put on the market by Altorfer Bros. Company, Peoria, Illinois, has an electric ironer driven direct from the washing machine. The ironer is connected up with the washer by simply lifting the wringer off the post and putting the ironer drive-assembly in its place.

The new ironer is controlled by foot, having a large pedal which is easily reached and requires but little effort.

The roll is of steel, electrically welded, and is 45 inches in length. Each time the tension is released the shoe drops away from the roll four inches, allowing access for waxing or cleaning the shoe.

The special feature, of course, is the fact that the washer and ironer are operated from a single motor.

NEW AUTOMATIC RECORDER FOR FURNACES

A new instrument, calculated to accurately analyze and record the percentages of CO_2 in flue gases, as well as detecting and indicating on the same chart the presence of combustible gases, has recently been developed by the Mono Corporation of America, of Buffalo, N. Y. With the installation of the Duplex Mono, calculations, tables, and curves are eliminated.

AMMETERS AND VOLTMETERS FOR SWITCHBOARDS

The Westinghouse Electric & Manufacturing Company has placed a new type of switchboard ammeters and voltmeters upon the market. The company states that these have been designed especially with a view to accuracy as well as ruggedness of construction.

An example of the new SX type voltmeter

These instruments operate on the D'Arsonval principle. All have external zero adjusters and are so constructed that the movement complete with core and pole pieces assembled can be removed as a unit in order to facilitate inspection and repairing.

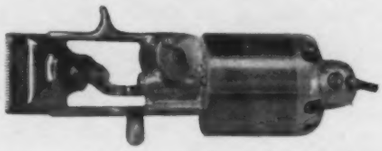
Special instruments may be had with this type instrument for use as differential voltmeters for paralleling generators, ground detector voltmeters and "leakage detectors," double reading am-

meters and voltmeters, pyrometer millivoltmeters, temperature indicators and speed or frequency indicators.

NEW POWER HAIR CLIPPER

Since the innovation of the power hair clipper in the barber business, there has been a constant demand for a device easy to handle, more compact, and lighter than those in use.

Prompted by this demand, a San Francisco barber has invented a power clipper with the motor attached to the handgrip of the clipper. This does away



The new Stocking Clipper which has been developedby G. Stocking, a San Francisco barber.

with the trolley, clipper stands, and the flexible cable. The clipper is so small that it can be placed in an ordinary work drawer, just the same as the hand clipper, and can be used in any position or angle, without the handicap of the flexible cable, which is too stiff to allow free use of the clipper.

The especially small motor has an advantage of two speeds. The load speed is 10,400 r.p.m., the worm 520. When the thumb screw of the clipper is turned down the speed is 8,600 r.p.m. and the worm 430.

STANDARDIZED SAFETY UNIT

A combination safety-first switch, conduit box, and compensator with low voltage and overload protection for the motor, has been standardized and adopt-

This portable switchboard is an unusually convenient combination of a 500-v. a.c. General Electric combination safety first switch, conduit box, and compensator.

ed by the Bethlehem Shipbuilding Corporation, Union Plant, San Francisco. The device is mounted on pipe supports, and combines safety with greater adaptability.

Books and Bulletins

The Thermionic Vacuum Tube

By H. J. van der Bijl; 391 pages, 6x9, published by McGraw-Hill Book Company, New York City, and for sale by Journal of Electricity, San Francisco.

The device described by the title of this book, more commonly known as the audion, has been the basis of recent marvelous advance in transcontinental telephony and in wireless. The author, as former research physicist for the American Telephone and Telegraph Company and Western Electric Company, has been closely identified with much of the development of this apparatus. The first four chapters of his book are devoted to an elementary discussion of the properties of electrons and the phenomena encountered in the conduction of electricity by dislodged charges. Succeeding chapters deal with the influence of gases in the bulb; on the characteristics of the tube; use of the two-electrode tube as a rectifier of alternating currents; the three-electrode tube, with emphasis on its use as an amplifier, telephone receiver, oscillation generator, detector, and modulator. The final chapter is devoted to its miscellaneous applications as a volt meter, high-tension current regulator, power limiting device, and high-tension switch. It will be of value to the man familiar with the calculus.

New Directory and Market Data Book

Crain's Market Data Book and Directory of Class, Trade and Technical Papers, now on the press, promises to be of interest to advertisers generally and users of trade and technical papers in particular. It lists the business publications of the United States and Canada, giving circulations, rates, type page sizes and closing dates, and also supplies a market analysis of each trade, profession and industry. The volume, which is bound in cloth and contains nearly 500 pages, is published by G. D. Crain, Jr., 417 S. Dearborn street, Chicago.

Electric Furnace Booklets

The Detroit Electric Furnace Company has issued a fourteen-page illustrated booklet describing its rocking electric brass furnace. The subject of repelling arc furnaces has been presented in supplement C to bulletin 40 of the Industrial Electric Furnace Company.

Catalog of Engineers' Office Supplies

Engineers and surveyors will be interested in a 40-page catalog of field and office supplies just issued by the C. F. Pease Co., of Chicago. This book lists drawing, profile, and cross-section papers, tracing cloths, blueprint papers and blueprinting machines, drafting room furniture, and such field supplies as transits, levels, ranging poles, leveling rods, etc. Prices and descriptions of each article are given and the book is fully illustrated. A copy of this new catalog may be obtained by addressing The C. F. Pease Co., 841 N. Franklin Street, Chicago, Ill.

Power Transmission

The Baldwin Chain & Manufacturing Company, Worcester, Mass., has issued catalog F covering its power transmission chains and sprockets, including roller chains, block chains, special chains, sprockets, etc. The company has issued bulletin No. 14, describing the selection of a chain drive, and also bulletin No. 17, giving data on sprockets for roller and block chains.

The Brascolite

An extensive line of fixtures is presented in Catalog No. 8, published by the Luminous Unit Company, division of the St. Louis Brass Manufacturing Company. Fixtures of every type of design are described and illustrated, and several novel designs such as fan and fixture combinations are presented.

Investment Banking Company Booklets

H. M. Byllesby & Company has recently published two interesting and significant booklets. One has been issued for the purpose of explaining the scope and services of the company. It states that the Byllesby organization is an investment banking company engaged in the underwriting and wholesale and retail distribution of the bonds, notes and stocks of certain electric, gas and water-power companies and industrial enterprises.

In all these companies supply service to about 500 cities and towns containing 2,200,000 people in 16 states. For several years a consistent endeavor has been made to promote saving and sound investing in the preferred stocks of these companies. Out of approximately $14,500,000 of preferred stock taken by local investors about $1,000,000 has been acquired by wage earners on the partial payment plan. About 5,000 such accounts are now carried.

In explaining the details of organization, The Byllesby Engineering and Management Corporation is announced. This is a closely allied company completely equipped with engineering, construction, management, accounting and legal departments.

A booklet entitled "Save with a Smile" presents in an attractive manner the subjects of Thrift, Compound Interest, Investment, The Judging of Investments, and Byllesby Sponsored Securities.

New Heater Catalog

The Ross Heater & Manufacturing Company, Inc., of Buffalo, New York, announces its new Catalog "F" which illustrates and describes the various types of heaters, condensers, expansion joints, coolers and Airjector pumps which it manufactures.

Washing Your Dishes

A most attractive booklet under the above title has been published by the Walker Brothers Company of Syracuse, New York. Herein the art of dishwashing is covered in detail and pictures most convincing as to the electrical way illustrate each step.

A stiff cardboard leaflet with complete directions for using the dish washer is designed so that it can hang on the wall near the machine. A series of pamphlets which the dealer can use to advantage have also been issued.

NEW ELECTRICAL DEVELOPMENTS

(The installation of a new electric steel furnace and plans for extensive development at a point on the Columbia river are among the news items from the Northwest. News of a movement to establish an air mail terminus in a certain bay city and of the incorporation of a new power company comes from the Pacific Central district. The Southwest reports plans for new lighting installations and a new terminal building. Two important proposed irrigation projects are reported from the Southwest district along with plans for developing power for Colorado smelters.—The Editor.)

THE PACIFIC NORTHWEST

BANKS, ORE.—The formation of a light and power system is being agitated by certain citizens of the city.

ILWACO, ORE.—The city is determined to have a power plant to replace the one which burned down last summer, even if the citizens finance it themselves.

PORTLAND, ORE. — The financing of the Portland Vegetable Oil Mills Company has been completed and the work of building a $430,000 plant will be commenced as soon as a site can be decided upon.

SEATTLE, WASH.—Articles of incorporation have been filed by the Table Mountain Power and Irrigation Company, which intends to operate for the purpose of buying, selling and generating electricity.

ST. HELENS, ORE.—H. F. McCormick, N. B. McCormick and H. B. Beckett have received corporation papers for the St. Helens Tie and Timber Company, general lumber and logging concern. Capital, $50,000.

PORTLAND, ORE.—G. F. Matthews of Hoquiam, Wash., has purchased a large tract of land at Linnton with a water frontage of 2,530 feet, with the intention of erecting a shipbuilding plant on the property.

PORTLAND, ORE.—Creation of a state irrigation commission, with three members having a salary of $10,000 a year each, is part of a plan to change existing irrigation laws in the coming session of the legislature.

OLYMPIA, WASH.—The La Crosse Electric Company has filed articles of incorporation through H. J. Welty, La Crosse. The trustees named are Nelson Grewell, E. S. Knowlton, and L. D. Hoover. Capital, $10,000.

GRANTS PASS, ORE.—Plans are being made for an irrigation project in the Illinois Valley, which will increase the lands in that section of the county by 6,000 acres. The plan is to so construct dams as to make use of Bollon Lake in the Siskiyous as a natural reservoir.

PORTLAND, ORE.—Contract has been awarded the Hurly-Mason Company for the work of completing the Hahnemann Hospital, which is to be used by the government under the terms of a recent lease. The work of completing the structure will cost in excess of $200,000.

PORTLAND, ORE.—The Aladdin Company, manufacturers of ready-made houses, have announced that their firm will enlarge its Portland factory to a capacity of six houses a day, to meet the demands of their growing business. The plant is electrically operated throughout.

KLAMATH FALLS, ORE.—There will be a new saw mill at Klamath Falls in the spring, according to the statement filed at Salem by the Klamath Logging Company. It will be erected on the Bray site at the lower end of Lake Ewauna. The amount of capitalization is $250,000.

COLUMBIA RIVER, WASH.—Umatilla county can develop a minimum of 120,000 hp. on Umatilla Rapids, three miles from Umatilla east of Arlington. 150,000 acres are subject to reclamation by such a method. The estimated cost including the dam is $20,500,000. Most of the water would be employed for pumping on arid lands.

VALE, ORE.—An appropriation of at least $1,000,000 will be made by Congress this year for the completion of the Owyhee project, according to P. J. Gallagher on his return this week from Washington, D. C., where he has been in the interest of eastern Oregon reclamation work.

SALEM, ORE.—Robert Cedergren, Gus Waldsburg, John Beattie and J. H. Koch, of Gates, Marion county, have filed with the state engineering department an application for the appropriation of water from Horn creek to be used for mining purposes and the development of electric power.

SEATTLE, WASH.—Various electrical dealers in the small towns in the Puget Sound district prior to the holidays conducted sales campaigns of considerable proportions, and from reports these campaigns were very successful. Especially were they valuable in increasing the Christmas sales volumes.

SALEM, ORE.—The development of power for towns in Goose Lake Valley, Lake county, is contemplated in an application filed with State Engineer Cupper by S. A. Mushen and C. D. Cronemiller of Lakeview, who seek permission to appropriate water from Camas and Deep creeks, tributaries of Warner Lake, for power development.

MARSHFIELD, ORE.—The citizens of Bandon, in planning to purchase the distribution system of the Bandon Light and Power Company in order to combine it with a new plant they wish to construct, have had a valuation of the company's property made. This shows the value of the entire system, including plant, boilers and other equipment, to be $43,850.

PORTLAND, ORE.—There was a decided gain in building in Portland for 1920 over the year 1919. The total for 1919 was 8,922 permits valued at $9,840,725, while the total for 1920, with December incomplete, shows a total of 10,127 permits with a total value of $11,920,900, or an increase of over 20 per cent. The outlook for 1921 is decidedly favorable.

GRANTS PASS, ORE.—Reuben Mining Company has been granted permission to take water from Reuben Creek for the development of 87 horsepower to operate aid compressors and furnish light. A dam of logs and rock, a flume and ditch 8½ miles long, a wood headgate, Pelton wheels and pipe constitute the equipment. The cost is estimated at $10,000.

WENATCHEE, WASH.—The Wenatchee Gas & Oil Drilling Company has been incorporated with $500,000 capital, consisting of 200,000 shares of treasury stock and 300,000 shares of common stock, all having par value of $1.00 per share. The incorporators of the new company are Edmund Arthur Hayhew, of Seattle, and James C. Oliver, of Wenatchee.

SALEM, ORE. — Encouraging prospects in Columbia county, Oregon, where extensive deposits of iron ore have recently been discovered, for the establishment of an iron industry on the Columbia river, are described in the biennial report of the Oregon bureau of mines and geology. A revival of activity in gold, silver, copper, lead and zinc mining is deemed possible as a result of investigational cooperation with the federal bureau.

TACOMA, WASH.—Wage cuts of from 15 to 25 per cent in the lumber mills of the Northwest will become effective January 1, or when mills now closed are reopened, it was announced recently by the local branch of the Loyal Legion of Loggers and Lumbermen. Under the new scale common labor will be reduced from $4.40 to $3.60 per day, and skilled labor will receive a proportionate cut.

BEND, ORE.—A power reserve sufficient to take care of much larger pine milling operations than are now conducted here is to be created by the Shevlin-Hixon Company, when a battery of five tubular boilers will be added to the 11 now in use. The cost has not been computed by the officials of the company. The work is starting about January 15 and will furnish employment for a crew of 40 men for a month or more.

PORTLAND, ORE.—The Electric Steel Foundry of Portland recently placed in operation its new Moore Rapid Electro-melt, three-ton, 1500-kw. steel furnace. The furnace is operated "acid," and is used for melting down high-grade steel scrap for steel castings. The electrodes are automatically controlled, which keeps the load well balanced between the three phases, and prevents excessive fluctuations in the load. The installation of this furnace makes the Electric Steel Foundry one of the finest equipped steel foundries in the Northwest.

THE PACIFIC CENTRAL DISTRICT

DINUBA, CAL.—The trustees are discussing the installation of proper lighting facilities here.

SAN MATEO, CAL.—City Attorney Kirkbridge has been instructed to draw up resolutions for the installation of new street electroliers.

SACRAMENTO, CAL.—An additional bond issue of $700,000 will be necessary to furnish the money to complete the filtration plant here, according to C. G. Gillispie, resident engineer.

SAN FRANCISCO, CAL.—Among new companies incorporated is the El Dorado Power Company, with capital stock of $100,000. The directors are Evan Williams, A. L. Shannon, W. C. Fox, Jr., T. E. Fölck and D. Y. Lamont.

SAN FRANCISCO, CAL.—Among applications for building permits is one by the Pacific Gas & Electric Company. The application includes foundations for building and machinery for substation at Main and Howard streets, the cost estimated at $12,500.

DELANO, CAL. — Private individuals have made application for use of part of the natural flow of the north fork of the Stanislaus river. It is contemplated to erect a power plant at the headwaters of the river to develop about 9,600 horsepower, involving an expenditure of $2,000,000.

CORCORAN, CAL.—A new industry was launched at Corcoran the past week when two bales of cotton were ginned by the Corcoran Cotton Growers' Association at their new gin, which has just been installed to care for the crop in that vicinity. The new association is capitalized at $25,000, of which $17,000 has been subscribed.

OAKLAND, CAL.—A movement is under way here to enlist the chamber of commerce and other civic organizations in the plan of securing Oakland as the terminus for trans-continental air mail service. Men interested in aviation and postal matters are lending their assistance to back the movement.

REDDING, CAL.—The Pacific Gas & Electric Company has paid $90,000 in this city for between 1500 and 2000 milers' inches of water diverted from Battle Creek and its tributaries through the Loggerhead and Asbury ditches in the neighborhood of Shingletown and Manton, Tehama and Shasta counties.

REDDING, CAL.—The Pit River Power Company has made an application to the Federal Water Power Commission in Washington for a preliminary permit for power development on Pit river above Copper City. The commission has fixed February 10 as the time for hearing the application and considering any objections that may be made in the meantime.

GILROY, CAL.—Members of the city council have decided to accept the offer of $24,000 made by the Coast Counties Gas and Electric Company for the local gas and electric plant. The city attorney has been instructed to draw up the necessary papers in order that the deal may be closed. Henry B. Fisher of San Jose has been elected city engineer by the council.

FRESNO, CAL.—Providing a means of irrigation for a total of 3,093 acres of farm land distributed in northern and southern Kern county, a portion of which is being planted to vines, trees and cotton for the first time this year, 59 new power line extensions and farm pumping plant connections have been made in this district recently by the San Joaquin Light & Power Corporation, according to announcement made by D. L. Wishon.

THE PACIFIC SOUTHWEST

SANTA BARBARA, CAL.—It is reported that a wealthy resident of this city is planning the erection of from 150 to 200 homes here, to cost from $4500 to $5000 each, as an investment in the foothill district.

SAN FERNANDO, CAL.—The Hackworth-Roberts Electric Company has taken over the garage on Porter Avenue. Mr. Hackworth will manage the electrical part of the business and Mr. Roberts the garage.

RIVERSIDE, CAL.—Fruitvale Mutual Water Company was authorized on January 3 by the Railroad Commission to issue $400,000 of stock and $260,000 of first mortgage 7 per cent serial bonds. It is estimated that approximately $352,900 of stock will be issued in exchange for water certificate contracts or issued to present consumers for cash.

LONG BEACH, CAL.—Plans have been prepared by the city engineer of Long Beach for the installation of 176 ornamental standards on East Ocean Boulevard between Alamitos and Grand Avenues. The posts will be from 125 to 150 feet apart with four to the block on the north side and three to the block on the south side, with one opposite each intersection.

LOS ANGELES, CAL.—Plans have been completed for a $100,000 terminal building at the twin harbor for the crack passenger steamers, Harvard and Yale, according to a recent announcement by the Los Angeles Port Commission. The building is to be completed by April 1, when the Harvard and Yale are scheduled to inaugurate their coastwise service.

LOS ANGELES, CAL.—Backed by Kansas City and Philadelphia financiers in a corporation capitalized for $6,000,000, it is proposed to construct eight dams on the Colorado river in Mojave county, Arizona, producing 480,000 hp., which would make it possible to electrify some 500 miles of the A. T. & S. F. Railway and to irrigate approximately 600,000 acres of land, the application for a permit having been made by F. L. Beyard of Seligman, Arizona.

HOLLISTER, CAL.—The Coast Counties Gas and Electric Company is building a transmission sub-station on Lover's Lane.

RIVERSIDE, CAL.—At a meeting of officials of San Bernardino, Riverside and Redlands, a committee was appointed to file objections with the Water Commissions, both federal and state, against the applications already made by private parties for water rights, and to file claims on water rights in the mountains for the cities to be included in the project. There are several available power plant sites in the San Bernardino mountains, including the possibility of bringing Little Bear water to this side of the mountains.

PHOENIX, ARIZ.—An investigation of the electric service of the Central Arizona Light and Power Company, formerly the Pacific Gas and Electric Company, will be made by the Corporation Commission, according to a recent notice and order. The commission is making this investigation in order to determine more exactly what the company may reasonably be required to spend in securing new business so as to provide some means whereby the company may keep the commission advised of what deposits the company has received from prospective customers to the end that the commission may exercise such supervision as may be necessary in the refunding of these deposits.

THE INTER-MOUNTAIN DISTRICT

AMERICAN FORK, UTAH.—Estimates and plans are being prepared covering the cost of improvements to the street-lighting system.

AMMON, IDA.—The Utah Power & Light Company, Salt Lake City, Utah, has been granted a fifty-year franchise covering the right to maintain and operate electric light and power lines in this village.

STAR, IDA.—A delegation of farmers consulted the Public Utilities Commission as to the necessary steps to take to have a transmission line erected between this place and Nampo, a distance of five miles.

BOISE, IDA.—An ordinance granting the Utah Power & Light Company an electric light, heat and power franchise for a period of 50 years was passed at a recent meeting of the board of trustees of Ammon.

SALT LAKE CITY, UTAH.—The Utah Power & Light Company has filed applications with the Public Utilities Commission of Utah for certificates of convenience and necessity covering its operations in Trenton, Cache county, and Orem, Utah county.

ELY, NEV.—The Navada Consolidated Copper Company reduced wages at their plants to a scale approximating that of June, 1918. The reason given was the present state of the copper market, large stocks of unsold copper, and high production cost.

DENVER, COLO.—The foundation for a new 1250-kw. turbine to be installed in the Sterling plant of the Colorado Power Company has been completed. The switchboard has been placed and the big engine is expected to be installed soon after the first of the year.

BRIGHAM CITY, UTAH.—The location for the new municipal electric light plant has been definitely fixed at a point below the old power plant of the Brigham City Electric Light & Power Company. It is planned to have the enlarged plant ready for service early next year. The amount of energy to be generated at the site selected is approximately 1200 horsepower.

PAYSON, UTAH.—The town of Payson is contemplating the installation of an up-to-date street lighting system within the near future. It is planned to take immediate steps to create a special lighting improvement district, and the work of installing the improved system will be taken up at the earliest possible date, with the expectation of having same in operation by early spring.

LOGAN, UTAH.—L. R. Neeley of Logan has applied to the state engineer for 2.22 second-feet of water right in the Bear river in Cache county. The diverting works will consist of a concrete headgate, short canal, electrically propelled pump and a short line of ten-inch pipe. The water is to irrigate 161 acres of land.

IDAHO FALLS, IDA.—A new irrigation project to be known as the Canyon Creek Irrigation Company is now under way. The company will interest itself in the building of canals, the establishing of water rights and the reclamation of lands. A reservoir site has been obtained on Canyon Creek, southeast of Newdale. This reservoir will impound 1600 acre-feet of water, and supply enough for the irrigation of 9,000 acres of land.

DENVER, COLO. — An illumination exhibit was given in the Albany room January 7 and 8 under the direction of W. J. Barker, general manager of the Denver Gas & Electric Light Company. This demonstration showed how factory production will be increased in some instances from 15 to 25 per cent, at an added cost of from one to five per cent. These demonstrations are being conducted by R. W. Shenton and Walter Sturrock, illuminating engineers of Cleveland, Ohio.

PARK CITY, UTAH.—Preparatory work is now in progress for the installation of a 150-horsepower electrically operated pump on the 2000 level of the Ontario Mining Company. The various electric light, telephone and other wires will be replaced by a 2½-inch cable. This cable will be connected from the surface to the 1700 level and will carry 11,000 volts. From this level it will be transformed to 440 volts, distributing power to run the pumps and other machinery on the 1700 and 2000 levels.

RENO, NEV.—The surveying party from the Federal Reclamation Service which has been at work in Spanish Spring Valley north of this city has found a possible storage capacity of 300,000 acre-feet and underground conditions that make for feasibility of dam construction. Spanish Spring Valley has long been considered one of the best available water storage sites. There is about $500,000 in reclamation funds available for the scheme and as soon as the cooperation of the water users of Newlands project is assured, this sum can be put to work developing the new district.

LOGAN, UTAH.—Steps are being taken in Cache county for the formation of the Petersboro-Mendon irrigation district, comprising about 10,000 acres tributary to the two towns which give it its name. The territory concerned is now partly served by the recently installed Skeen electrically operated pumping plant, which has a capacity for raising 100 second-feet of water from the Bear river to a height of sixty-seven feet, with one or two electrically operated auxiliary pumping plants for taking water out of the canal for still higher levels. It is planned to take over this plant and the water rights, extend the system to serve additional lands, and bond the district to make the payments.

DENVER, COLO.—The project which is being worked out in connection with a power enterprise on the Gunnison river above Lake City, in Hinsdale county, promises to have a far-reaching influence on the smelting situation in Colorado. It is reported that New York and Denver interests have secured an option on the Reynolds-Stearns company, and upon the water power rights of the Lake Fork; also that these interests propose to establish at and below Lake San Christobal a power plant which will generate from 8,000 to 10,000 minimum horsepower. The estimated installation cost is about $125 per horsepower, which will permit the surplus power being used for electrical smelting of the great bodies of lead-zinc ores of Hinsdale county at a cost estimated much less than present smelting rates together with prevailing freight charges.

CAUTIONARY TALES FOR THE YOUNG

There once was a lady named Babel
Who sat with her feet on the table,
But one day the toaster
Proceeded to roast her,
And now she is naught but a fable.

There once was a youngster named Cluses
Who always would monkey with fuses,
But one day a shock
Knocked him over the block,
And now he is covered with bruises.

There once was a boastful young blade
Who swore he could jump a cascade;
He slipped on an herb 'n'
Got mixed in the turbine
Below, where the power was made.

* * *

High voltage transmission is of course a specialty in the West, but we think the following item, which appeared recently in an industrial review, is a world's record:

"Greenville—Great Western Power Company Increases Voltage from 22,000 to 44,000 Horsepower."

No doubt this enterprising company is also increasing its output by several thousand ohms, and building a high-head dam with a storage capacity of 100,000 volts.

* * *

Thinking of things to be thankful for, some one suggests that—

Prohibition has at least reduced the number of men who think they can sing.

There's still foam left on the ocean.

* * *

The rising generation appears to be more at home with insulators than insects, judging by a recent story concerning the small son of a well-known electrical engineer. When visiting in the country he unhesitatingly picked up a hornet to inspect its mechanism more closely. When his father hurried out to discover the cause of the commotion which immediately broke the peace of the summer day, the little lad was ruefully sucking a thumb while tears streamed down his face.

"Why, what is the trouble, son?" he asked.

"It was that bug," he managed to explain between sobs. "I think his wirin' is defective. I touched him, and he wasn't insulated at all."

The mysteries of the meter provide considerable mental exercise for the uninitiated consumer, and no little entertainment for the power company.

Not long ago an irate customer demanded an audience with the manager. He was referred to the credit manager.

"I want you," he began, "to send a man to my apartment immediately to fix the meter."

"At the apartment number you give," replied the credit manager, "we have no meter. You are therefore referring to our gas meter, and now what appears to be the trouble with it?"

"Yes, it's a gas meter; it sets just behind the gas range and the trouble is my door bell won't ring."

An employe in this same company maintains that it was this man's wife who recently ordered her meter out because "I do not want the phone any longer."

* * *

The force of habit if not carefully watched may be the source of many pitfalls. We are told, for instance, that an editor at a dinner-table, being asked if he would take some pudding, replied in a fit of abstraction: "Owing to lack of space, we are unable to find room for it at present."

* * *

Questionnaires, from income tax forms to passports, have got the public into such accommodating habits that it wouldn't turn a hair if the meter reader were to ask how many pairs of curtains there were in the house. Some time ago a gentleman made application for telephone service at the sales counter of a Los Angeles office. The salesman asked him if there was an instrument on the premises, to which he replied, "Oh, yes; we have a piano."

* * *

ELECTRICAL HYBRIDS — VI

The Insulatorang-outang

The insulatorang-outang
Looks Irish and pugnacious,
But when you need protection, you
Will find him efficacious.
He's quite impervious to shock,
And has no fear of fire;
Whenever tension grows too high
Just get him on the wire.